THE
AGRICULTURAL BULLETIN
OF THE
FEDERATED MALAY STATES.

No. 7.] APRIL, 1917. [Vol. V.

AGRICULTURAL CONFERENCE, MALAYA, 1917.

THE first Agricultural Conference of Malaya was held at Kuala Lumpur on 25th to 28th April, 1917.

The following Committee was appointed to make all arrangements:

Chairman—Mr. L. Lewton-Brain, *Director of Agriculture*;
Members—Mr. R. C. M. Kindersley;
„ R. W. Munro;
„ F. G. Harvey;
„ L. Mooijaart;
„ H. C. E. Zacharias, *Secretary, P.A.M.*;
Hon. Secretary—Mr. B. Bunting, *Assistant Agriculturist.*

The first session was held at the Chamber of Commerce, Kuala Lumpur, on 25th April at 2.30 p.m., there being about 75 visitors present.

The Director of Agriculture (*President of the Conference*) was in the Chair and in opening the Conference extended a hearty welcome to the visitors to the Conference and said that he expected that the papers to be read would prove of benefit to all. He hoped that a great part of their value would be in eliciting the opinions of all those attending. Every opportunity would be given for discussion and he hoped that everybody would avail themselves of it freely.

The Chairman then introduced Dr. S. H. R. Lucy who read his paper on "Health and Sanitation on Estates."

The next session consisted of a visit to the Offices of the Department of Agriculture on 26th April at 8.30 a.m. The visitors, of whom there were about 110, were first conducted round part of the Experimental Plantation and shown a number of economic products which were being grown on an experimental scale. At 9.30 a.m., a demonstration of the rubber vulcanizing and testing station, acetic acid plant, fibre and paper making machinery, etc., was given. Later, the visitors were shown the various laboratories and inspected specimens of various diseases and pests, besides various economic products grown at the Government Plantations.

The third and all subsequent sessions were held at the Chamber of Commerce, Kuala Lumpur.

At the third session Mr. R. W. Munro (*Vice-President*) took the Chair at 2.30 p.m., on the 26th April; the audience numbered about 120. The following papers were read and discussed: "Cultivation and Manuring" by Mr. A. P. N. Vesterdal, "Cultivation, Drainage and Manuring" by Mr. F. G. Spring, and "Rubber Seed Selection" by Mr. A. H. Malet. A further paper on "Seed Selection" by Mr. J. McNicol was taken as read.

The President again took the Chair at the fourth session (owing to the absence through illness of Mr. R. C. M. Kindersley, Chairman of the Planters' Association of Malaya) at 9 a.m. on the 27th April, the attendance numbered about 150. The following papers were read: "Leaf and Stem Diseases of Hevea" by Mr. R. M. Richards, and "Clean Clearing and Root Diseases" by Mr. W. N. C. Belgrave. Owing to the absence of the writer through illness a paper on "Clean Clearing Pest and Diseases" by Mr. W. R. Shelton-Agar was taken as read.

At 11.30 a.m., the Conference adjourned for half an hour. On resuming other papers were read as follow: "Pests and Diseases of Coconuts" by Mr. R. M. Richards, "Termites" by Mr. P. B. Richards, and "Application of the Agricultural Pests Enactment" by Mr. F. W. South.

Mr. F. G. Harvey (*Vice-President*) took the Chair at the fifth session, which started at 2.30 p.m. on the 27th April; the audience numbering about the same as at the morning session. The following papers were read: "Thinning Out" by Mr. T. J. Cumming, "Thinning Out" by Mr. E. W. King, "Factory Methods" by Mr. F. G. Souter, and "Preparation of Raw Rubber" by Mr. B. J. Eaton.

The final session was held at 9 a.m. on the 28th April with the President in the Chair. The attendance was somewhat disappointing, there being only about 50 present, which included several numbers of the Agricultural Department. The following papers were read and discussed: "Foodstuffs in Malaya" by Mr. F. G. Spring, "Cultivation of Liberian Coffee" by Mr. R. W. Munro, "Economic Products in Malaya" by Mr. F. G. Spring, and "Observations on Coconut Experiments" by Mr. W. S. Cookson and Mr. G. E. Coombs, while, in the absence of the writer, Mr. I. H. Burkill's paper on "Food Crops in Malaya" was taken as read.

In publishing the proceedings of the Conference the papers will be grouped under the following headings:

(*a*) Rubber Cultivation;

(*b*) Pests and Diseases;

(*c*) Rubber Preparation; Coconuts; Health and Sanitation;

(*d*) Minor Economic Products.

RUBBER CULTIVATION.

CULTIVATION AND MANURING.

By A. P. N. Vesterdal,

(*General Manager, Mount Austin Estates, Johore.*)

MANY interesting articles on tillage of soil and various other matters in connection with this question have from time to time appeared in the *Agricultural Bulletin*, and what has been mentioned in those articles I shall only touch lightly upon.

The general principles of cultivation will apply to most crops, but of tropical agriculture I only know rubber, and what I have to say will, therefore, refer only to rubber trees, and mostly to those planted on poor undulating land. Trees planted on virgin land or alluvial soil will continue for many years to grow well and to yield well, and although I do not doubt that cultivation would increase the crops anywhere, it is, for the present, not required here to the same extent as it is on poor land.

All over the Peninsula large areas formerly cultivated with pine-apples, gambier and tapioca have been planted with rubber. The state of such land is well known, it is always up in lalang and blukar, and, generally speaking, it is exhausted; firstly, on account of the crops taken, and secondly, because of the frequent burnings of the lalang.

Through fires some valuable foodstuff is always wasted, not only what goes away in the air by the burning process itself, but also what is afterwards washed away with the ashes by heavy rains even on gently sloping hills.

Trees planted on this kind of land take a long time to reach maturity, and the result is often far below average. It will always be below average, if nothing is done to help the trees along.

The usual method of clean weeding is not so satisfactory here as it is on good flat land. It is certainly the cheapest, but in this particular case the cheapest, in my opinion, is not the best, as it will sooner or later lead to retarded growth of the trees. In some instances the retardation is shown when the trees are from two to three years old, and in other cases it is not noticeable until tapping has commenced.

It is always said that tapping does not hurt a tree, and it is true that it does not hurt those growing on first class soil, but it hurts weak trees. Whether the cause is removal of latex or removal of bark, I do not know, but the fact remains, that trees in tapping do not grow so quick as trees not in tapping. It is not unusual that

trees grow quite well up to the time tapping is started, and after that they almost cease putting on girth, even if they are only lightly tapped.

On such trees improvement is a necessity. They are simply starved, the bark-renewal is bad, and if they do not get some nourishment it is only a question of time when the flow of latex will cease, if not altogether, then anyhow to such an extent, that the profit per acre will be very much reduced, which, of course, is the wrong way to go.

There are thousands of acres with that sort of starved trees in the Peninsula. As far as I have seen the south is considerably worse than further up country, but there are some everywhere, and I think that something more could be done to resuscitate those trees than has hitherto been the case.

To start manuring on a large scale before it has been properly ascertained what the soil is lacking is not wise, and before going to such expense it would be the natural thing to try to improve matters by cultivation.

When a young hilly plantation on old lalang land has been kept perfectly clean for some years big quantities of the top-soil have been washed away, leaving the ground hard, and under such conditions the trees are unable to get the full benefit from the more or less scanty supply of plant food present.

The chief object of cultivation is to prepare the soil in such a way that absorbable plant food can be formed and held until used by the plants.

As a whole, the question of nutriment of plants is very extensive and complicated, and I shall, therefore, on this occasion, confine myself to the mentioning of a few facts.

It is common knowledge that all plants require, in order to live, the following ten elements: oxygen, hydrogen, carbon, nitrogen, sulphur, phosphorus, potassium, calcium, iron and magnesium, or what is easier to remember, four bases, potash, lime, magnesia and iron dioxide and four acids, carbonic acid, sulphuric acid, nitric acid and phosphoric acid.

The plants obtain their supply of carbon chiefly by assimilation of carbonic acid through the leaves, and the leguminous and a few other kinds of plants are able, aided by bacteria, to assimilate and utilize the free nitrogen from the atmosphere, but otherwise all plant food is taken from the ground, mostly dissolved in water, but in some instances dissolved by the acid exuded by the young rootlets.

A small amount of carbonic acid contained in the water is assimilated by the roots of plants, but besides this carbonic acid is of some use in the ground, mostly by bringing inorganic matter into solution.

As far as oxygen is concerned this element is of importance not only in the atmosphere, but also in the soil. Here it plays an important part in the formation and transformation of most nutritive compounds, and it is essential in the ground, because the roots of plants breathe in the same way as the stems and branches breathe. Oxygen is also required by many bacteria, which are important for transforming certain foodstuffs into absorbable compounds, for instance, transforming ammonia into nitric acid, in which form the plants take most of their supply of nitrogen, and also for transforming decaying matter into absorbable substances.

In a hard and compact soil the bacteria referred to do not thrive, and their well-being is only ensured by cultivation.

If the ground is not properly ventilated suitable solutions cannot be formed either for want of water or for want of air, and it is thus obvious that a well aerated and permeable soil is of the greatest importance to the plants.

On uncultivated land the water, which is the main factor in all plant life, cannot penetrate properly. After heavy showers it just runs off, and I believe that starvation of rubber trees is frequently due to an insufficient supply of water.

Cultivation helps to retain the water, and between old trees it also helps to retain fallen leaves, which are often washed away if the surface is too smooth.

Cultivation is mostly done by changkolling and amongst old trees this cannot very well be done otherwise, but young clearings can almost always be treated cheaper and better by the use of agricultural implements, ploughs and harrows.

In the course of time several different kinds of harrows have been tried on plantations, and at a certain period disc harrows were much in favour. On the estate with which I am connected we also tried some, but we did not find them satisfactory. In hard soil the discs could not work, and where they worked they only loosened a couple of inches of the soil, resulting in very bad wash.

About two and a half years ago we commenced ploughing, and on one of our sections 2,200 acres out of 2,800 have been treated.

The first ploughing was done by a small one-handled American plough, "Luzon," which did very good work, but since then a bigger type of a two-handled Danish plough, "Fraugde," has been introduced and is now used exclusively. It is quite an ordinary plough, but so strongly made, that it does not break when encountering the usual obstacles in the ground.

I know that some planters have tried ploughing and given it up on account of the difficulty of teaching the bullocks to drag the plough, but I may say that we have never experienced any trouble

in that respect. In a few days any pair of bullocks will learn to walk steadily if attended to by a good cooly. Bullocks walk better when dragging the plough in a pole fixed to the shoulder harness than when dragging by means of an ordinary rope.

When ploughing the first time with the small plough one pair of bullocks with two coolies were only able to treat three-fourths of an acre per day, but with the bigger plough at the second and subsequent ploughings they can do as much as one acre per day. It should be mentioned here that the soil is very light, consisting chiefly of a sandy loam.

The cost of ploughing with everything included, wages to coolies, bullock food and depreciation on bullocks, and machinery comes to abut $2.40 per acre. Harrowing is cheaper, as a team can treat four acres per day. The harrow we use is divided into three parts, each two feet wide, and this construction makes it possible to treat undulating ground better than with a harrow in one piece. The harrow is used partly for levelling the ground and partly for checking grass in young clearings. In old clearings they are not used.

Out of the 2,200 acres 12 teams usually plough about 300 acres per month, and the ground can thus be treated about twice a year.

The ploughs, going to a depth of about five inches, turn the soil so well that the ordinary small kinds of grasses are buried completely. On a well-cultivated soil such grasses do no harm, they help to prevent wash, and they increase the humus in the soil when ploughed down.

When the talk is about toxins, I presume that these are formed where the grass cover is kept more permanently. I said before that clean weeding is the cheapest, but the cost where ploughs are used does not come to much more. The land must be gone over once a month to remove obnoxious weeds and small bushes, but the expenses incurred by this work, added to the cost of ploughing and harrowing, average only about 80 cents per acre per month.

Where ploughing is commenced before the trees are three years old the soil can be treated to within one and a half feet of the rows of the trees. Later on it may not be safe to go quite so close, but I see no reason why ploughing, when started early, should not be continued also when the trees grow big, anyhow where thinning is carried out judiciously.

The plough furrows should as far as feasible run across the slopes on hills, as otherwise there is the danger that those left open when the ploughing is finished will be acting as drains.

At the first ploughing, and also occasionally at the second, it happens that fairly big roots are cut, but I have so far seen no bad effect from this.

The damaged roots are perhaps more liable to attacks by Fomes, but the danger is not great because the frequent turning and airing of the soil is sure to reduce the virulence of any *mycelium* in the ground.

All roots cut by the ploughs throw out whole bunches of new roots which, owing to the loose nature of the ground, have a tendency to go deeper down. This is quite contrary to their habit on uncultivated soil, where the roots always lie near the surface, and where the young rootlets sometimes even go above it. The young rootlets from rubber trees often form one mass, and when the ground is ploughed or changkolled these are all spoilt. But in a fortnight it will be found that new rootlets are taking their place, and this lively action of the roots can only be beneficial to the trees.

The cutting of the roots has been one of the points against cultivation, and another is, that the uneven surface of the ground causes too great a loss of moisture.

I do not think that the root-question need cause any alarm, and in a climate like this where rain is so plentiful the loss of moisture by evaporation from the ground cannot have serious consequences, at least not where something is done to keep the water.

A loose top-soil is of vital importance, and rubber trees respond very well to proper treatment in respect of cultivation, but it should not be overlooked that retarded trees cannot suddenly throw out sturdy shoots from weak branches, and the effect of cultivation is not to be expected until after a year's time. To judge the result by measurement of the girth of the trees only is not sufficient. The general appearance of the trees, the colour of the leaves and the thickness of the shoots have all to be taken into consideration, and if they are there is always a marked difference between trees on cultivated and uncultivated land.

With a view to gaining some knowledge concerning the effect of artificial manure on rubber trees many experiments have been carried out with rather varying results. It has been said once in a report that the good results of some experiments supposed to be due to the manure, was really the effect of turning over the soil when digging down the manure, and that view is probably correct.

It is in any case difficult to arrive at anything like exact figures as to the result of an experiment carried out on soil not cultivated before.

We have had two experiments running for some time, one on young trees and one on old trees, but as far as the latter is concerned the result is not very encouraging.

Previous experiments have proved that young trees respond very well to manure. We started our experiment on the three

years' old trees mostly with a view to trying the effect of lime together with artificial manure on light soil, and the various blocks received different quantities of kainit, basic slag, bone-meal and superphosphate with and without lime.

This experiment was started in April, 1915.

With the exception of the blocks receiving lime and kainit separately and also those receiving the two stuffs mixed, all the blocks have gained on the check-blocks.

Lime, as a whole, seems to have done more harm than good, as all the blocks to which manure only has been applied show better results than those receiving lime as well.

Kainit does not seem to have had any effect at all and the blocks manured with this stuff are losing on the check-blocks.

The best result is shown on the blocks receiving bone-meal at the rate of 400 lbs. per acre, but the effect of the same quantity of superphosphate is not far behind. The effect of basic slag and the smaller quantites of manures is less apparent, but it is quite satisfactory.

At the time the manure was applied the trees were very retarded in growth. The improvement from them until now is very marked, and some further effect from the slow-acting manures is still to be expected.

Altogether, 50 plots of two acres each were experimented with.

5 Plots were kept as check ;
3 „ were manured with Lime, 1,200 lbs.
3 „ „ Basic slag, 400 lbs.
3 „ „ „ 800 lbs.
3 „ „ Superphosphate, 400 lbs.
3 „ „ „ 800 lbs.
3 „ „ Bone-meal, 400 lbs.
3 „ „ „ 800 lbs.
3 „ „ Kainit, 1,000 lbs.
3 „ „ Basic slag 400 and lime 1,200 lbs.
3 „ „ „ 800 and „ 1,200 lbs.
3 „ „ Superphosphate 400 lbs. and lime 1,200 lbs.
3 „ „ „ 800 „ and lime 1,200 lbs.
3 „ „ Bone-meal 400 lbs. and lime 1,200 lbs.
3 „ „ „ 800 „ and „ 1,200 lbs.
3 „ „ Kainit 1,000 lbs. and lime 1,200 lbs.

The experiment on the old trees was carried out on decidedly over-tapped and backward trees. It was commenced in November, 1915, with the double object of improving the growth of trees and improving the yield.

Regarding the latter the result is so far disappointing. Out of four plots, Nos. 1 and 3 were manured, No. 2 was changkolled only, and No. 4 is kept as check.

A record was kept of the yield for seven months before the manure was applied. During the succeeding 12 months the yield of plots Nos. 1 and 3 rose by only 1 lb. and 6 lbs. per acre per annum, respectively, whereas the unmanured plots, Nos. 2 and 4, rose by 20 lbs. and 51 lbs., respectively.

During the last four months the yield of No. 1 has increased considerably, but as there has been a general increase all over the estate and as the check-block also shows an appreciable increase it is hardly fair to attribute the whole increase of No. 1 to the effect of the manure.

The check-block had the best trees, and we naturally reckoned that a heavy dressing of manure would improve Nos. 1-3 to such an extent that they would at least be just as good as the check-block, and I am unable to explain why it did not.

The following quantities of manure were applied per acre:

Field No. I—

500 lbs. basic slag and bone-meal, mixed;
600 „ lime;
100 „ superphosphate and muriate of potash, mixed.

Cost per acre, $36.77.

Field No. III—

500 lbs. basic slag and bone-meal, mixed;
600 „ lime;
100 „ concentrated superphosphate.

Cost per acre, $36.32.

The manured trees look much better than those not manured and this improvement is sure to tell upon the yield in future, but that more than a year should elapse without any noteworthy increase of the yield seems to indicate that the mixtures were not the most suitable for this particular soil.

Discussion.

The Chairman (Mr. R. W. Munro): rising, after the applause given to Mr. Vesterdal had subsided, said: The subject chosen by Mr. Vesterdal is a very wide one and all of us will agree as to the importance of cultivation and the manuring of soil. If this is the first, as we hope it is, of what will be a series of Agricultural Conferences, I think that we shall find that the question of the cultivation and manuring of soil is one that will have to receive a very large degree of attention at our Conferences. Mr. Vesterdal is in a position to tell us a great deal because he is in charge of

a very large area—some people might understand a large area to mean about 50,000 acres, but I think 10,000 acres is a very large area indeed. The experiments that Mr. Vesterdal has told us of have been carried out over a large area which Mr. Vesterdal controls, and I think, therefore, that we can rely on the information given to us as being of extraordinary value. But I do not think that Mr. Vesterdal, or anybody else for that matter, would like to lay down any hard and fast rule, because I think that you will all admit that cultivation of soil in this country is yet very much in its infancy. I think that you will agree in reading through the paper—which you will have an opportunity of doing, as all of these papers are to be printed in book form—that it contains a greater deal of information than you can possibly grasp in the course of half an hour as this Conference will not be able to take them up for discussion now. I had the opportunity of reading through Mr. Vesterdal's paper this morning before this meeting and I have no doubt that it is a very important one.

As to artificial manuring, it is a matter that varies a great deal with the soil, and we know that Mr. Vesterdal's experiments were made on poor soil which would necessarily show greater progress than on soils that it is not necessary to treat in that way. Now, we have not very much time to dwell on these questions long, but I must thank Mr. Vesterdal for coming from so far as Johore to read this paper to us, which I have no doubt will be extremely valuable to us. (Applause.) I will now call upon Mr. Spring to read his paper.

CULTIVATION, DRAINAGE AND MANURING.

By F. G. Spring, N.D.A., F.L.S.

(*Agriculturist, F.M.S.*)

IN the past few years many changes and improvements have been made in rubber planting but this is only what would have been expected considering the size and importance of the industry. It cannot be claimed, however, that there has been any great advancement in knowledge of soil culture and artificial fertilizers as applied to rubber land. The varying conditions under which a rubber tree can be grown are partly responsible for the somewhat slow progress. Hilly and flat lands should not be treated in all respects alike and the same applies to heavy and light soils, deep and shallow.

The objects of tillage are to make the soil lighter, more porous and permeable to roots, to enable vegetable and mineral matter to decompose more rapidly, to promote oxidation and stimulate the activity of nitrifying bacteria, to loosen the particles of soil and mix them, to check the growth of weeds and reduce soil evaporation.

Soil Cultivation and Drainage.

Tillage is of the utmost importance but it requires to be applied to suit conditions. Heavy yields of rubber are obtained, in many instances, on land which has never been tilled and which is comparatively poor in essential plant food constituents but in such cases it is generally found that the mechanical condition or mixture of the soil is excellent. Rich lands are sometimes very poor yielders and this may be owing to quite a variety of causes but a not uncommon one is mixture of soil. The mechanical condition of a soil is of the greatest importance in rubber growing, more so, perhaps, than its chemical. Improvements can be effected in this direction by tillage and the turning under of green manures, the latter opens up heavy soils and renders light soils heavier, or in other words tends to establish an equilibrium.

I will deal in the first place with hill cultivation and then refer to treatment of undulating and flat lands. It is common knowledge that tillage cannot be carried out on hill land without considerable loss by surface wash, but several methods may be adopted to enable one to cultivate a soil properly and yet reduce surface wash to a minimum. A cover-crop on the land is a reliable preventative, but, unfortunately, there is always a period of soil wash following tillage even with a plant which rapidly reproduces itself.

Terracing has much in its favour but can only be recommended provided it is done previous to planting. The terraces require to be

at the same elevation throughout otherwise the object aimed at is lost. Any wash from the slopes is retained on the flat terraces and this assists in the nourishment of the tree. Should the land be very steep it is advisable to plant some cover-crop such as *Centrosema plumieri* on the slopes and it may be desirable to establish a strong growing plant, for instance, citronella or lemon grass, along the edge of the terraces. The flat terraces are maintained clean weeded and tilled when required. I have seen remarkably good results from rubber grown under such conditions and have no hesitation in recommending it for hill land. One estate in Negri Sembilan has a good area planted in this way and the writer was much struck with the growth of rubber there as compared with that of similar age in adjacent fields. Terracing cannot be recommended for previously planted areas and in such cases circular plots may be gradually constructed around the trees, this is best commenced when the trees are quite young, the diameter of the circle being increased as the tree ages. Should these plots be kept well tilled it is surprising how rapid growth is and there is every prospect of an excellent root system being developed.

With regard to drainage of hill land I think it is generally agreed that contour drains are unsatisfactory while perpendicular ones are good examples of what not to do. I am doubtful if any type of open drain, on hill land, serves its purpose in an efficient manner and in the majority of cases it is better to dispense with drains altogether and adopt some such system as that referred to.

In the case of undulating land tillage can generally be effectively carried out without any material loss. On the flat and gently undulating country, cultivation is, I believe, more essential and beneficial than on the hill, the obvious reasons being that flat land is, as a rule, heavier in nature, and has not as good air circulation, consequently responds better to cultivation. There are various forms of implements of tillage, ploughs, cultivators and harrows which do excellent work and may be used to great advantage on the flat and gently sloping lands, provided the timber has been cleared and estate drains do not materially interfere with the work. Tillage should be commenced at as early an age as is possible in order to compel surface roots to grow at a greater depth in the soil and thus enable tillage to be done, in later years, with a minimum injury.

The changkoll and fork are the most common implements of tillage here, and I propose, therefore, to make a few remarks regarding their efficiency. When used in young clearings it is, I believe, a waste of labour to changkoll or fork all over the area. Should one commence this type of tillage in circles around each tree, increasing the diameter as the root area develops, it is probable that excellent returns will be obtained when costs are considered. Ultimately, the circles would meet and tillage would then be conducted all over the land, the greatest attention being given to culture in the middle of

the rows. As regards depth of tillage this will, of course, depend on the nature of the soil, but generally speaking, the heavier the soil the greater the depth required.

Cultivators and harrows are more economical but, unfortunately, they can only be used in certain cases. On Castleton Estate, Telok Anson, harrows have been in operation for some considerable time, where they have done good work at a small cost. The cost of tillage of the first one or two applications is comparatively high but decreases as the tilth improves.

With regard to drainage of flat land it is well known that this is of the utmost importance. Should a soil be water-logged, or the water level near the surface, it is impossible to have a good tap root developed, the absence of one being often evident by loss of trees during wind and rain storms. Cultivation and manures will not effect a remedy, in fact it is waste of money to adopt either until drainage conditions are first improved.

There is some difference of opinion as to when tillage should be done. Personally, I think the best results are likely to be obtained when done towards the end of the wet season in order to conserve the then abundant water for the dry period.

Soils which are more or less baked on the surface have lost, and continue to lose, a good deal of water by soil evaporation. In some instances the surface is like a brick and should this condition be present on a slope the majority of rain water merely runs off the land. It is obvious that to cultivate a soil during a dry season is expensive but in addition to this you effect a remedy after considerable damage has already been done in loss of soil water. To cultivate at the close of a wet period bears out the old saying: "Prevention is better than cure." Tillage to a depth of two or three inches will greatly assist in the conservation of water.

With regard to the cultivation of old clearings the soil of which has not been previously turned over to any depth, one must use a good deal of discretion. It could not be recommended to till this soil in such a way as to destroy surface roots, both large and small, in a drastic fashion. Light changkolling, in the first instance, should be carefully done and all large roots avoided. I do not think much harm is done in cutting numbers of small surface roots, as a better root system is, by cultivation, encouraged at a greater depth in the soil. The depth of tillage may be gradually increased as time goes on. There is little doubt that the best root system is developed when tillage is commenced while the trees are quite young, one must devote attention to soil cultivation, at some time or other, if maximum yields of rubber, good bark renewal and healthy trees are to be maintained.

Dynamite has been considered, for some time past, in connection with rubber growing and may possibly prove a valuable method of

soil culture particularly as a means of breaking up heavy sub-soils. Experiments were conducted at Kuala Lumpur Government Plantation with dynamite where good results were obtained as regards girth increase of young rubber. The greatest objection would appear to be that of cost.

Manuring.

The question of artificial fertilizers as applied to rubber is a rather delicate one and requires to be carefully considered. As long as good yields can be obtained by cultivation it is probably a mistake to resort to manuring. At Castleton Estate, Telok Anson, an extensive series of manuring tests are being conducted on good class land and the results obtained so far would not appear to justify their application, and many estates with rich soils would, in all probability, behave in a similar way. There are, however, many cases where it would appear that manuring is to be recommended and the man with long practical experience can generally discover those areas.

A test was conducted in the Kuala Lumpur Gardens with young rubber growing on poor laterite soils with the following results: In the first year, the trees in the manured plots, in every case, showed a good excess in girth measurements over the trees in the unmanured plots. In the second year, there was no manure applied, and the average girth increases for this period were about equal to that of the control plots, which goes to prove that the manures had good effect for one year only. At the commencement of the third year, a second application of similar manures was applied, and the results for this year were also satisfactory but the excess was not as large as that of the first year. In the fourth year, no fertilizers were applied, and it was found that the manured plots had not given as large an average girth increase as the control plots. In this particular soil, the manures appear to have had a stimulating effect, as regards growth, after each application, for about one year but afterwards there seemed to be a slight reaction. Over the four years, however, the total girth increases of the manured plots in every case considerably exceed that of the controls. At the close of the four years tapping was commenced and it was found that the control plots gave the poorest yields of rubber while the highest yields were obtained from those manured plots which gave the largest girth increases. This is the result for the first nine months of tapping and it will be interesting to see how long the high yields are obtained. In the ninth month of tapping the manured plots continue to give the proportionate excess of rubber over the unmanured plots, and there seems no evidence at present of a declining superiority; rather the contrary. I have not the slightest doubt that the fertilizers in this soil were beneficial, for we would appear to have recovered the costs of application in the first nine months of tapping. It should be remembered that increase of girth means a corresponding increase in length of tapping cut.

Good results from manuring might be expected from the following: poor, light, laterite soils, soils deficient in one or more essential plant food material, thinned out areas which are slow in recovering from the effects of close planting and areas which have been severely tapped in the past.

As regards the method of application this will depend on the age of the trees. With young rubber, I believe, the best value is obtained by spreading the manures around each tree, the area treated would naturally vary with small and large trees and increase as the rubber ages. The manures are best turned under to a depth of two or three inches, sufficient to prevent loss by surface wash. With older rubber the manures may be broadcast all over the land but more especially about the middle of the rows and then turned under. I do not favour the placing of manures in trenches around a tree as in this area the manures are too concentrated and for a time limited to a small root feeding area.

I do not propose to deal with quantities of manures to be applied, per acre, as this varies more or less with each fertilizer. Information, however, can be obtained on application to the Department of Agriculture.

With regard to the kinds of manures I might mention that a complete fertilizer consisting of sulphate of ammonia, double superphosphate, sulphate of potash with the addition of lime gave the best results in the Kuala Lumpur Gardens. Comparatively good returns have also been obtained from Perlis guano, bone-meal and basic slag.

Lime and its Application.

One of the chief effects of lime on a soil is to accelerate nitrification and thus enable plants to draw upon the nitrogenous and potash stores in the ground. It has a neutralizing action on organic acids which helps to sweeten sour soils. Lime has a beneficial action on clay soils by breaking them up, while sandy or light soils are improved by binding the particles together. In order to obtain the full benefits of artificial fertilizers I think it is essential to apply a small dressing of lime beforehand, this should be done several months previous to the spreading of the fertilizers on the land. There are many soils in Malaya which would, I feel sure, respond well to lime treatment. Quick lime is the best form of application, the lumps being distributed throughout the field and allowed to slake naturally. One night's rain is sufficient for this decomposition to take place but in dry weather it may take several days. The result is a fine dry powder which is found easy to distribute equally over the land. Slaking lime in this country in a large heap and adding water does not appear to give such a fine dry powder as the natural process and the cost of distribution is higher.

Before closing this address I would like to refer briefly to costs.

Costs of Tillage and Fertilizers.

Establishing Cover-crops.—I will give in some detail the cost of establishing *Centrosema plumieri* as this is one of the most promising cover plants for rubber clearings. The seed is dibbled in at distances of three feet apart each way at a cost of $3 per acre, 3 pounds of seed being required. The price of seed, at present, is from 25 to 50 cents per pound, which is somewhat high on account of the limited areas planted. The cost of weeding until the plant is well established amounts to about $3 per acre and if this sum is charged to ordinary estate weeding it will be seen that the total costs amount to from $4.25 to $5 per acre. The seed is sometimes broadcast at the rate of ten pounds of seed per acre on a well-prepared surface, but dibbling is preferable.

Canavalia ensiformis is best dibbled in three feet apart requiring 8 pounds of seed per acre or 15 pounds if broadcast. The cost of weeding until *Canavalia* is established is higher than in the case of *Centrosema,* owing to the habit of the plant.

It may generally be taken that large seeds such as those mentioned above give the best results when dibbled in, while small seeds such as horse gram require to be broadcast. When broadcasting is the method of sowing, the land is first changkolled or forked to a depth of about three inches, sufficient to provide a good seed bed, and this will cost from $2 to $3 per acre.

Horse gram (*Dolichos biflorus*) sown broadcast requires 12 pounds of seed per acre, which can be obtained in the local markets at six to seven cents per kati. The cost of broadcasting is 25 cents per acre. Sarawak bean (*Doliches Hosei*) is best established from cuttings and this system of planting is slightly higher than dibbling on account of additional cost of procuring and planting cuttings.

Terracing.—A six-foot terrace made by three feet cutting and three feet filling in costs 25 to 30 cents per 50 feet length, which amounts to about $10 to $12 per acre allowing on an average 20 feet between the terraces. It might be mentioned that the cost of maintaining well-made terraces is small, considerably less than upkeep of drains.

Dynamite.—Sixteen cents per charge, inclusive of labour, is a reasonable figure, one charge per tree is generally what is allowed but with heavy clays more may be required.

Cultivation.—The following are the actual costs of various methods of cultivation, conducted at Castleton Estate on a heavy soil. Plot 1, three crops of horse gram were grown within a year, at a cost of $17.45 per acre. In Plot 2, surface weeding was conducted monthly at a cost of $10.71 per acre per annum. The treatment in Plot 3, was monthly weeding and changkolled twice per year to a depth of four inches which amounted to $18.27 per acre per annum. Plot 4 was changkolled once every three

months to a depth of four inches for $21.96 per acre per annum, while in plot 5 the land was forked once in three months to a depth of four inches at a cost of $21.21 per acre per annum. In Plot 6, harrowing was conducted twice a month for $7.26 per acre per annum. The harrows were first drawn by buffaloes but Indian bullocks were found to be very much cheaper. A couple of bullocks can harrow five acres per day of eight hours. The above figures are the results obtained in one year, but now the costs of changkolling, forking and harrowing are very much less, in some cases about half, while surface weeding remains more or less the same. It is usually found that as deep tillage is continued the costs become less, for a time, until a high class tilth is formed when charges remain about the same.

Artificial fertilizers.—The cost of spreading artificial manures varies somewhat according to the quantity applied. Two hundred and fifty lbs. of a mixture can be broadcast and slightly covered for $1.80 per acre.

The cost of applying 1,000 lbs. of lime spread around young trees and turned under amounts to about $9 per acre, inclusive of labour, while one ton broadcast all over the land, and turned under would cost, approximately, $23 per acre. A complete mixture consisting of $\frac{1}{2}$ lb. per tree, sulphate of ammonia, $1\frac{1}{2}$ lbs. per tree, double superphosphate, 1 lb. per tree, sulphate of potash, and 1,000 lbs. lime per acre was applied at a total cost of $28 per acre (November, 1911).

A dressing of four cwts. Perlis guano cost $8.50 per acre, while three cwts. Bone-meal worked out at $13 per acre (November, 1911).

Discussion.

The Chairman (Mr. R. W. Munro): Here again, gentlemen, we see what an extraordinary amount of instructive knowledge we can gain from these papers. I think you will all notice how very particularly the views of Mr. Spring agree with those of Mr. Vesterdal on this subject. Both have, I think, dealt with the subject quite independently of each other, and yet both of them agree on the main points. One of the greatest points of interest I wish to invite discussion on is the matter of drainage. We must thank Mr. Spring very much indeed for the valuable information he has given us. I invite you to discuss this subject for as long as we have time. I think Mr. Prior will give us his views on the matter.

Mr. Prior said that he wished only to mention what had been his experiment on Golden Hope Estate in manuring during the last 18 months, on what was known as "peat land," on a plantation that had been planted in 1907 and first tapped in 1912. Three portions of 10 acres each had been tried with basic slag, lime and forking, respectively. In 1913 the whole field was forked over and 12 pikuls of lime per acre applied. All plots were tapped during the

first period of six months with two cuts on $\frac{1}{2}$ tree, alternate days, and then on one cut on $\frac{1}{3}$ tree daily. The yields of No. 1 latex and scrap rubber were recorded and the figures given below are the weights of wet crepe, weighed 15 hours after machining.

Plot No. 1, 10 acres, 1,015 trees, 1 ton basic slag per acre and forked 22nd to 30th July, 1915, cost $48.68 per acre. Crop for first six months, 860 lbs., second six months 985 lbs. (showing an increase of 125 lbs.); third period of six months 1,264 lbs., daily tapping as previous period, increase of 404 lbs. over first period.

Plot No. 2, 10 acres, 1,017 trees, one ton lime, 10 tons crushed limestone per acre, and forked, August, 1915, costing $131.50 per acre: crop, first six months, 1,068 lbs.; second six months, 1,134 lbs.; third six months, 1,416 lbs.; increase over first period, 348 lbs.

No 3 plot, 10 acres, control plot, forked 1915, 1,460 trees: crop, first six months, 1,439 lbs.; second six months, 1,640 lbs.; third six months, 2,056 lbs.; increase over first period, 617 lbs.

Girth measurements of all the trees at three feet from the ground were taken in February, May and November, 1916. The average girth of the trees in each plot on the different dates was as follows:

	February, 1916.	May, 1916.	November, 1916.	Total increase, nine months.
	Inches.	Inches.	Inches.	Inches.
Plot No. 1 ...	26.50 ...	27.14 ...	27.73 ...	1.23
„ No. 2 ...	26.63 ...	27.20 ...	28.32 ...	1.69
„ No. 3 ...	27.20 ...	27.89 ...	29.23 ...	2.03

Mr. L. Mooijart said that as to manuring he once sent a sample of soil to Ceylon and was advised to put down a large amount of a certain mixture, and up to date he had not got much more from that plot than from any other. (Laughter).

Mr. G. H. Bennett: May I ask how much per acre was used? (Laughter).

Mr. Mooijart: I am sorry I have not come prepared to tell you that.

The Chairman reminded the meeting that the time was short and that they might go on discussing just for the time available.

Mr. Prior said that he understood Mr. Spring to deprecate the idea of contour draining as against terracing. He wished to know what system of contour draining he had in mind. Was it the old Ceylon system?

Mr. Spring: I meant hill land. I do not know the Ceylon system but the one I referred to is 1 in 25.

Mr. Prior: The old system in Ceylon draining was on the scale of 1 in 20, which carried a lot of water to the valley down below.

Mr. SPRING: And carrying lots of soil, too. (Laughter.)

Mr. PRIOR: The system I have tried is one of short, blind drains quite level. According to the contour of the hill it goes all round and catches all the water. The trees grow well and there is no wash. I have seen the old Ceylon system by which the whole hill is washed away and there are tearing torrents, so that the hill gets nothing of the water to be retained for the trees.

Mr. SPRING: I have not tried that system you have practised, but I think it is a very good system. It would have as much beneficial effect as in the terracing system.

Mr. A. H. MALET next gave his experience of manuring on a 30-acre block. That was the only block on the estate that had not a single case of pink disease that year. (Hear, hear.)

The CHAIRMAN: Have you got any analysis of the mixture you tried?

Mr. MALET: Yes, I think so. A sample of the soil was sent to Mr. Kelway Bamber (Agricultural Chemist, Ceylon), to be analysed, and on the analysis of the soil the manure was made out.

Another planter said that in his experience he had found that rubber trees really fed their roots on the surface. It seemed strange, therefore, to find that both Mr. Vesterdal and Mr. Spring recommended that the soil should be dug down and that the trees should feed below. How could such an idea be reconciled with the views expressed?

The CHAIRMAN: I think that you will take it from either gentleman that what they intended to imply was that as the roots get down to the more permanent manure you get better results.

Mr. SPRING: The principal ideals in the matter of cultivation are to get the roots to go down and stop too much evaporation of moisture. If you get that done, I think it would be found beneficial to get the roots down so that you can continue the cultivation.

THINNING OUT.

By T. J. Cumming,

(*Manager, Seafield Estate, Selangor, F.M.S.*)

IN the early days of rubber planting few realized to what magnitude a tree 15 to 20 years old would attain, and most planters made the mistake of planting too closely—some more, some less—common distances being 10 ft. × 10 ft., 10 ft. × 15 ft., 12ft. × 12 ft., 15 ft. × 20 ft., and so on.

Though these distances have since been found to be too close there is a good deal of reason in the case of the early planter who planted closely, as no one at that time could foretell the future of the marketable product, and, while the price of rubber was booming at 10*s.* to 12*s.*, there was a lot of profit to be made off an acre carrying from 150 to 300 trees, and in the case of the private owner, he naturally wanted the maximum yield in the minimum time.

Then, too, labour was cheaper, and the profits were sufficiently large to allow of little extravagances, or rather, what appear as extravagances to-day, to be glossed over.

Need for Thinning.

The slump in the price of rubber caused planters to look around for ways and means of curtailing expenses, and a point that was quickly apparent was the fact that practically the same crop could be, and was, being got off an acre carrying 100 trees as off an acre with double the number of trees, and the cost of tapping in the latter case was naturally double the former.

There appeared also with the close planting the delay in bark renewal, and this, of course, meant loss of money, as the longer the period required for renewal the less the yield per acre over a period of years. To commence with, a two years' renewal was considered sufficient, and it appeared to be so until the next two years' renewal came to be operated on, when it was found the bark was not nearly ready for tapping, and wounding and reduced yields were the result.

It was noticed that trees on the outside of the fields or near roads where there was any extra space appeared to have a much better bark renewal than those inside, and this probably first led one to consider the necessity of light and air to procure good healthy bark renewal in a reasonable period.

The Agricultural Department were at the same time working on the subject of the rubber tree and it was pointed out in various lectures and bulletins that latex was formed in the leaves of the tree, and that without a good head of leaf the tree could yield but little latex. Well, as everyone knows, with close planting all the lateral branches get pushed or drawn up almost perpendicularly in order to

catch the little light there is at the top and instead of having a tree with fine wide-spreading foliage, there is something closely resembling a "swizzle stick."

If height was all that was wanted for tapping then close planting would be the correct thing, but, as girth of stem and lots of leaf are the main factors necessary to ensure profitable yields, close planting undoubtedly fails.

Fear of loss of crop through thinning should not deter any one from tackling a closely planted field as, if the thinning is done while the trees are fairly young, the remaining trees will quickly respond to the improved conditions and the crop will soon reach its normal figure and pass it, while the longer thinning is delayed, the more crop is to be lost.

Disease too is a factor which has had a lot to say in the necessity for thinning out. As has been already stated, light and air are absolutely necessary for the well-being of the tree and nothing is more conducive to the spread of disease than closeness and damp.

Another advantage in wide planting is that after rain the surface of widely planted trees dries much more quickly and allows tapping to go on early, while sometimes with close planting tapping is impossible for a few hours after a heavy shower.

There is also the saving in labour and utensils, and I need not go into details to show this, as previous papers on the subject have dealt very fully with this point. It is obvious that if an acre with say 100 trees yields the same amount as an acre with 200 trees, there is a considerable saving in labour and only half the number of cups, spouts, etc., are required, while the percentages of output are bound to be to the advantage of the wider planted area, as there is half the number of trees, spouts and cups to give "scrap."

Methods of Thinning Out.

The difficult question for the planter to start with is whether to thin out by selection or remove every alternate tree if his original planting allows of this.

On one estate the original planting was 20 ft. × 20 ft. and in order to get more trees to the acre this was interplanted with a quincunx, thus ⁚ · ⁚ · ⁚ giving double the number of trees to the acre and if it were found necessary to thin out, the quincunx could be removed.

The necessity soon arose, and when it came to thinning out, the ravages of Fomes, white ants, wind storms, etc., had been left out of account and many quincunx trees had to be left in to make up blanks, and it got so confusing in places that the original 20 × 20 line was frequently mistaken for the quincunx.

The theory is all right as a theory.

In ordinary square planting the best method in my opinion is by *frequent* selection. It takes much longer and seems to keep the

work of thinning out dragging on for a long time, but there is less crop lost this way, as each round the trees which are not paying their way are removed, giving the advantage to the adjacent trees, the yield per acre is not greatly reduced and the cost of tapping is automatically reduced.

With present day planting thinning out should not present any great difficulty as provision can be made for thinning out in the early stages. The time for thinning out is just as soon as growth is being hampered by branches interlocking, probably when the trees are about four years old. If a clearing is planted 20 ft. × 20 ft. with a view to thinning out later to leave say 70 or 80 trees per acre, the trees to be removed could be marked after careful examination and comparison with adjacent trees, and any branches interfering with the development of the favoured trees could be removed periodically as the necessity occurred. The marked trees could in this way be tapped for a considerable time in the regular round, enabling a fair return of latex to be obtained before they are finally removed and leaving them with very few heavy branches to cause damage while they were being felled. Of course, the ideal system would be to allow each tree eventually the same space, but this, I fear, would be impossible in practise, as weak unhealthy trees are frequently found side by side and have to be removed, while good trees have to be left near each other to make up the number per acre.

There are various methods of removing the tree. Some recommend pollarding the first stage, tapping the stump so long as it gives latex, then removing it. This system I have found not at all profitable. It is much more difficult to remove the pollard than it is the whole tree, as in the latter case the head gives leverage when the side roots are cut away, while the pollard has to be lifted bodily from the ground. The pollards yield very little latex after the first few tappings, and tappers are inclined to be careless with the tapping of them, and this carelessness, like other diseases, soon spreads to the good trees. The roots of the pollards too are still feeding and the adjacent trees are not benefiting to the same extent as if the trees to be cut out had been removed wholesale.

Another system is to cut off the tree about a foot above the ground, but since the discovery of *Ustulina zonata* I fancy this system is not much in favour.

The most satisfactory way is to cut out the tree about two feet below the level of the ground, removing as many of the side roots as possible without interfering with the roots of the adjacent trees which are to remain. The cut out trees and branches should be burned, or otherwise removed as quickly as possible, to prevent an invasion of borers and the spread of disease.

I have to thank the General Rubber Co., Sumatra, for the privilege of seeing their report on thinning out and for permission to use their recommendations.

THINNING OUT.

By E. W. King,

(*Technical Manager, Société Financière des Caoutchoucs, Selangor.*)

I have been asked to read a paper on "Thinning Out," paying particular attention to points which are open to discussion. I think I may take it as granted that everyone agrees with the principle of thinning out and that the only points about which controversy is probable are: (1) the time at which it should be done; and (2) the extent to which it should be done. I have, therefore, divided this paper into two parts. The first part showing the reasons for it and the second part giving the main lines on which I consider it should be carried out.

PART I.

Everyone has seen the result of trees which have been left closely planted. In some cases old nurseries have been left for several years with the result that they have shot up into a number of long poles with a few leaves at the top, from this to the case of a tree planted in the open by itself you get the varying degrees of malformation due to insufficient sunlight. The importance of sunlight to the health of a plant cannot be too strongly insisted on. The two sources of supply of material for the formation of plant food are the root system and the leaf system or head. The root system supplies water from the soil and soluble inorganic salts, which are essential to the health of the tree. The leaves supply the bulk of the material forming the tissues of the tree. They absorb carbon dioxide from the air and by the aid of sunlight transform it into starch and other substances needed in the tree's economy.

As young trees grow they soon fill up with the leaf system all the space allotted them. At this period in their life history if more space is not given them many consequences follow, the chief of which is the reduction in the rate of the growth of the trunk and hence in bark renewal. For, since the amount of plant food manufactured by the tree is proportional to its leafage and root growth, one of the first consequences of a limited growing space is that the tree's food supply does not increase but remains at the same amount. It should, of course, gradually increase to correspond to the constant demands made by the increased activities of the tree as it ages.

No green plant deprived of light can produce the chemical changes on which its proper supply of nutrition depends. Many planters, for instance, will have noticed the better growth of clearings with an

eastern aspect. The first effect of close planting is noticeable in the exaggerated upward growth of the trees, which, finding that their branches if extended laterally meet with the branches of neighbouring trees, attempt to overtop their neighbours with the result that their branches are drawn upwards, giving the trees the appearance of bundles of birch twigs.

Food that could be utilized in the thickening and rounding out of the trunk is used to build up length of branches and trunk, because, in the struggle for sunlight, each tree tries to overtop its neighbour. In consequence, an activity of no profitable use to the planter is induced. By giving the tree more space it will grow outward as well as upward and in a normal, evenly distributed growth. Let it be emphasized that thinning out to be most beneficial should be done before the "drawing up" stage has set in. Very little lateral branching will be induced in an old tree whose early environment has been an overcrowded estate.

I do not think it necessary to say anything further regarding the effect of sunlight on the branch growth. The effect on the depth of bark is equally noticeable and although it does not follow that a thin bark will necessarily yield less latex than a thicker bark it is extremely probable that coolies in getting the latex will touch the cambium and cause wounds over which the renewed bark will be poorer still. We may, therefore, take it as granted that a tree which has room for normal development as regards branch growth will prove more healthy than that which is retarded and that as a corrollary the yield from such a tree should be greater and the bark renewal better.

The second point is the great economy which is effected. The unit which is generally taken as a basis of all calculations is the yield per acre. If you can get a high yield per acre from a comparatively small number of highly yielding trees it is obviously more economical than if you got the same yield per acre from a closely planted estate. I think I may take a yield of 450 lbs. per acre as one likely to satisfy directors and shareholders, and to make every point quite clear we will take a suppositional case of two estates of 500 acres, one of which is planted with 80 trees to the acre and one with 160 trees to the acre—other factors being the same—a reasonable task being 400 trees per cooly. With a check-roll average of 40 cents the cost of collecting will be:

A. $\frac{100 \text{ coolies} \times 350 \text{ days} \times 40 \text{ cents}}{225{,}000}$ = say, 6.2 cents per lb. Labour only

B. $\frac{200 \text{ coolies} \times 350 \text{ days} \times 40 \text{ cents}}{225{,}000}$ = Twice the above

It has often been argued that in a widely planted clearing coolies would not be able to do the same task. In practise this is not the case, the work of tapping and collecting takes up the time, not the distance

to walk between the trees. In addition to the cost of labour there are the following items: fewer cups, spouts, wire, etc., are required, and a smaller labour force with its attendant expenses in line accommodation, recruiting expenses and hospital charges. This applies mainly to estates employing Indian labour. In the case of estates which employ Chinese labour it will generally be found that the coolies work at a given rate per lb., this rate is governed by the amount of rubber a cooly can reasonably be expected to collect. To illustrate this we will suppose that a Chinese cooly expects to get 70 cents per diem; most planters have found that the number of trees a cooly can tap well has its limitations, and though, of course, every estate has its "star" tappers the capacity of the average Chinese cooly is, say, 450 trees. If then the trees are yielding at the rate of 6 lbs. dry per annum, a cooly tapping 450 trees can get a daily average of 8 lbs. which at 9 cents per lb. will give him the required wage; if, however, the trees are yielding at the rate of 3 lbs. he would have either to do twice the task or the rate would have to be increased.

Both these cases are possibly exaggerated, but if allowance is made for a slightly higher task in the case of closely planted trees and also a slightly higher yield per tree it is still very obvious that a closely planted estate is less economical to work.

Effect of Thinning Out on Disease.

Another point which most certainly should not be lost sight of is the effect of thinning out on plant sanitation. This is so closely connected with disease and pest work that I intend merely to call your attention to it.

Diseases which are giving the most trouble at the present time can be divided into three heads, the worst being (1) branch disease, *Corticium salmonicolor*, (2) stem disease, bark canker, and (3) root disease, *Poria hypolateritia*, *Ustulina zonata*. It is obvious that the stronger the plant the better its chances of recovery if attacked, in cases of branch and stem diseases if given proper treatment the effect of sunlight will greatly accelerate the cure. To prevent root disease the destruction of all butts and roots of rubber trees thinned out is essential and cannot be too strongly insisted upon. With proper precautions the mortality in old clearings should not be great, records from an estate with rubber about 12 years old show a loss of ·8 per cent. during the past two years. We now come to the debatable question of how it should be done.

PART II.

Young Clearings.

The days of 10 ft. by 10 ft. planting have passed and most estates are now planted 20 ft. by 20 ft., or avenue planting 14 ft. by 28 ft. or 15 ft. by 30 ft. Let us take a normal

clearing planted 20 ft. by 20 ft. or 108 trees per acre. This will, as a rule, come into tapping at 4½ years with an average number of 60 to 70 trees per acre, during the next year the number per acre will be increased to, say, 90, leaving about 10 trees per acre, which are still too small. I have made allowance for the loss of eight trees from disease, wind or other causes. The spread of a normal five-year-old tree on an up-country estate is, say, 18 to 20 ft., if then all trees are of a uniform size and shape there is a superficial area to allow for growth.

The remaining 10 trees have probably been stunted in growth for one of the following reasons: (1) poor soil, (2) deformed roots, (3) poor jât of tree. These trees will naturally grow at a slower rate than their neighbours and if retained might possibly be tapped in their sixth or seventh year, the yield from them will probably be poorer, and I consider that, as a general rule, as soon as 90 per cent. of the trees in a clearing planted 20 ft. by 20 ft. are tappable the balance might be dispensed with right away. It is both easier and cheaper to cut them out while still small. After this it should be the policy of the estate to take out trees by selection each year. The following are the measurements showing the spread of trees taken from clearings of normal growth at various ages:

6-year old	... ...	22 ft.
8 „	... ...	27/29 ft.
10 „	... ...	28/30 ft.

The number to be taken out yearly will depend on the average growth of the estate and no rule can be laid down other than this— *viz.*, that as soon as the natural development of the trees shows signs of being checked the number of trees per acre should be reduced. The first and most obvious signs are a large number of lower branches dying off and an upward tendency on the branches in their attempts to get sunlight.

The case of young clearings is comparatively simple and its practical application clearly shown by the following records:

A 1 Clearing.

Year.	Area tapped.	No. of trees per acre.	Yield per tree.	Yield per acre.
7th year ...	120 ...	121 ...	2.93 ...	355
8th „ ...	120 ...	86 ...	4.64 ...	401
9th „ ...	120 ...	77 ...	6.69 ...	533

It should be clearly understood that in the case of young clearings thinned out or widely planted originally, the yield per acre will not be as large as that on a closely planted estate. The effect will probably not be felt before the third or fourth year of tapping but it will endanger the health and yield of the estate in subsequent years when the estate should normally be increasing in value.

Mr. E. B. Skinner mentions the following case :

"On an area planted 10 ft. by 10 ft. when tapping was started there were about 300 trees to the acre, these were first reduced to 100 and afterwards gradually thinned out until the number was about 60 to the acre. It is interesting to note that at its best this area yielded as much as over 900 lbs. per acre, but after reaching this point, the area rapidly showed the result of close planting and before thinning out began the yield had dropped to below 400 lbs. per acre."

I might mention at this point that some of the enthusiastic advocates of thinning out point to the immediate results as shown in the increase of the average yield per tree. To some extent this is misleading, as if the work has been done in an intelligent manner the poor yielding trees will have been removed, which automatically increases the average yield of these remaining.

Old Clearings.

The case of old clearings is far more difficult and depends very largely on the age of trees. In the case of very closely planted clearings of 12 to 14 years I should recommend the acquisition of new land and planting at a reasonable distance. The trees can undoubtedly be improved, but it will of necessity be a long time before the increased yield of the individual trees balances the loss in yield per acre caused by the loss in numbers.

Clearings from Seven to Twelve Years of Age.

As a general rule, it will probably be found best to reduce the number of trees per acre to one hundred during the first selection. In this original selection it will probably be possible to pick trees and at the same time pay attention to spacing. Deformed trees, trees with forked stems, burrs, damaged heads, etc., will, of course, be chosen, but at the same time it will be necessary to take out a large number of trees which are perfectly healthy. After this the trees should be taken by selection and it would be well to mark the trees and keep them under observation for some time before cutting them out. The following year they could probably be reduced by twenty trees per acre and in the next year by ten.

Experience has shown that 60-67 trees per acre is sufficient in the case of 11 to 12-year old rubber.

Method of Thinning Out.

Formerly it was customary to pollard trees which it was intended to thin out at height of six to seven feet and tap them till the trees ceased to yield. Experience has shown that the rubber so obtained scarcely paid for the cost of tapping in addition to the danger of introducing a careless system of tapping. It is better, therefore, to take the tree right out. The tap root and any large

laterals should be dug out and burnt as old rubber butts have proved one of the most fruitful sources of *Ustulina zonata* and other fungus growths.

My suggestions are based on the supposition that directors have in view an average yield of say 450 lbs. dry per acre. Possibly they may hope for 500 lbs., but it must be remembered that with, say, 50 trees per acre this would mean an average yield of 10 lbs. per tree. The highest yield which I have records of for a section of over 100 acres is 8.33 lbs. per tree for a section of 110 acres of 13 to 14-year old rubber. This is still some way from the legend ascribed to a well-known planter of a single tree per acre connected with the factory by a pipe.

RUBBER SEED SELECTION.

By A. H. Malet,

(*Manager, Trong Estate, Perak, F.M.S.*)

ONE of, if not *the* most important of the problems that faces the rubber industry at the present moment is that of seed selection. It is a grave reflection on those who are technically responsible for the safe-guarding of millions of British capital that so far not the slightest effort has yet been made to guard the industry from the inevitable results of neglecting to provide for a supply of seeds from wholesome vigorous stock.

It is, moreover, as far as the writer is aware, the only tropical agricultural industry which is liable to this reproach. No sane planter thinks of buying any but tested seed when opening up an estate in tea, sugar, tobacco or cinchona, but hitherto almost any seed has been considered good enough for rubber. Individual efforts are made to secure seed from old trees, and certain well-known estates have in the past made considerable sums from advertising "seeds from well-known old trees," etc., but the claims of these estates to have more virtue in their seeds as prolific milkers and disease resisters than seed from other less known properties rest on a very shadowy foundation.

The question is not by any means an easy one to dispose of—further, it is almost an impossible one for the practical planter to undertake to solve. There are two main points at issue; they are the propagation of good caoutchouc-producing trees and the re-vitalizing of the trees themselves; of the two, the latter is certainly the more important.

The question then naturally arises, what is the relation between the vitality or disease-resisting power of a tree and latex production? Does it always follow that a strong healthy tree is a good milker and vice versa? As far as the latex production of individual trees is concerned the whole industry, at present, is on an equal footing—but this cannot be said of the disease-resisting qualities of all planted areas and in the humble opinion of the writer what is mostly to be feared is inter-breeding and consequent degeneration.

The flowers of the Hevea being uni-sexual, inter-breeding is impossible to stop, and thus one of the most important laws of Nature—namely, that vigorous growth and healthy life can only be secured when cross-fertilization takes place, is counteracted by our system of cultivation. In the jungles of the Amazon the law of natural selection is allowed full play and only the fittest survive, but

in Malaya every kind of germinated seed that is planted out receives a fostering care that is tending towards a state of things which *may* lead to an outbreak of disease resulting in the extinction of the industry much in the same way that *Hemileia vastratrix* disposed of coffee in Ceylon.

Leaving theory on one side, is there any evidence to show that degeneration is taking place? Possibly some may be found in the large number of trees, especially on the newer planted estates, whose bark consists largely of "stone" cells, so difficult to tap. A railway journey, say from Penang to Kuala Lumpur, reveals numbers of trees whose bark is covered with an unhealthy looking green fungoid growth. Neither of these conditions are natural, and although unsuitable soil, bad drainage, etc., play their part in producing them, there can be little doubt but that unhealthy stock in many cases is a contributory cause. Again it must not be forgotten that these degenerated specimens of Hevea produce flowers, the pollen from which may be carried some distance and cross-fertilize with some quite healthy tree, the seed from which may be being reserved for stocking nurseries; and so the game goes on.

Turning now to the question from a latex-producing point of view, the writer has been experimenting for some time with a view to obtaining reliable figures from which some conclusions may be drawn. Fortunately, the complete history of the trees experimented with is known, and is stated below.

Block A (trees now 17 years old) was planted with seeds taken from five years old trees which in their turn were planted from seed of the old trees originally brought to Perak by, I believe, Sir H. Low, so that they represented the third generation of the seed brought over from the Amazon by Wickham. The block was originally planted very closely and has been thinned down to an average of 90 trees per acre. For nearly two years 85 trees have been under constant observation, good, bad and indifferent milkers been duly noted. All diseased trees had been cut out and those that remain appear quite healthy. The latex from these 85 trees has been coagulated in the cups on various occasions, and the dry rubber from each carefully weighed on a medical balance and duly noted.

The result is that the average yield per tree was 155 grains per day from all the various tappings, only 33 trees gave results above the average, their average yield being 281 units per tree per day, while the average yield from the 52 trees below the general average is only 75 units.

Block B was planted up from seed taken from the trees on Block A when they were five years old and the trees here are consequently 12 years old. Fifty trees have been experimented on (one was found to be suffering from white ants and was cut out).

The results of the tappings here show a much more marked variation than those on Block A. The average of five days continuous tappings with suitable intervals gave the following:

1st	five days	average from	49 trees,	146 units.
2nd	„	„	„	164 „
3rd	„	„	„	120 „

During the third experiment the trees were in the middle of wintering.

The average yield of the first two experiments gives 155 units as in Block A, the average over 10 days of the best yielder was 771 units, and of the worst yielder only 31 units. Twenty-three trees gave yields above the average and 26 below the average. The daily yields of the best milker were as follows: 501, 858, 810, 901, 849, 754, 669, 830, 905 and 634. Daily yields of the lowest yielder were: 11, 26, 25, 7, 17, 10, 30, 52, 36, 89.

It will be seen from these figures that the yields from both best and worst milkers are fairly steady. Such variations as are shown being easily accounted for by climatic conditions. In no instance has it yet been found that a tree yields heavily one day and poorly on another. Assuming that the seed had been properly selected from the best milkers in Block A and that each tree gave a yield equal to the average yield of the best 23 trees—*i.e.*, 252 units per tree, the output per acre would be increased by over 60 per cent.

Even allowing that trees vary in their yields very considerably during the course of a year, it is difficult to suppose that the variation is as great as the differences between the best and worst milkers.

It will be noticed that the averages in Block A of the best and worst milkers are 281 and 75, respectively, against 252 and 73 of those on Block B, or a slight reduction in the following generation.

While I am well aware that the figures quoted cannot by any means be called conclusive, as the experiments have only been carried on during a short period of time, I do think they are convincing enough to call for a thorough investigation under strict scientific control. I may also add that I am going to continue to take records of these trees for at least twelve months, when I hope to be able to publish the results.

If a case can be made out to support the suggested degeneration of our stock what is to be done in the matter? Two alternatives seem to suggest themselves. Firstly, seed can be taken from trees that have been proved good milkers through a sufficiently long period of testing, and planted out in a clearing completely isolated from any chance of cross-fertilization from outside trees. When these trees are tappable, careful records of their milking capacity, resistance to disease, etc., should be kept over another sufficiently

long time to enable all unsuitable trees being eliminated, and the process again repeated until the whole stock could be guaranteed. Instead of seeds, cuttings could be used to start with, or as an alternative, but in either case the whole process of selection or re-selection would take at least 20 years before a final result could be be attained. This, therefore, does not seem a very suitable procedure.

The other alternative is to introduce new stock from the Amazon. The whole matter should be under Government control, and seed in such quantities imported that a sufficient supply for the needs of the whole Peninsula could be assured. I would also suggest that a Mycologist be sent with the expedition to study any disease that might attack trees in their wild state. Experiments in variation of yield might also be made on the spot.

The future of the rubber industry demands immediate action. Such an expedition as suggested would naturally entail considerable expenditure, but even £50,000 or £100,000 would not be too much to pay for the protection of the immense interests at stake.

The example of the Dutch Netherlands Indies Government in taking control of all tobacco, sugar and cinchona seed distribution should be a sufficient indication to our own Government of the necessity of controlling an industry which is now rapidly becoming, if it has not already become, their chief source of revenue.

Discussion.

The Chairman (Mr. R. W. Munro): We have heard something extraordinarily interesting just now. We expected to have another paper to-day on this subject, but I think we can take it as read, as it will be duly published. But this from Mr. Malet is quite one of the most interesting we have ever had. Any planter in any country knows the position and knows it from the start. But the whole question covers so much ground that it is rather difficult to see how we are going to start this very excellent proposition. In importing seeds and trees there are difficulties, but the seed which you wish to have imported is the chief thing after all. The principle laid down by Mr. Malet is, of course, sound. In giving my own opinion on the matter I should certainly say that all of us planters entirely agree with everything that Mr. Malet says. We are, I am sure, much obliged to him for his very interesting paper.

RUBBER SEED SELECTION.

By J. McNicol,

(*Manager, Kuala Pertang Estate, Kelantan.*)

THE Rubber Industry has now reached a stage when it behoves planters and others directly interested to consider the welfare of their plantations.

There is no gainsaying the fact that luck has followed in the footsteps of rubber planting, and no great credit for its success can be claimed by any one in particular up to the present. Even to-day, you can scarcely find two planters—or would-be experts—to agree on the fundamental principles of the industry. The reason for this divergence of opinion would seem to be, that individual planters have not had the time, nor inclination, to make the necessary study of the why and wherefore; consequently, the industry from the point of view of scientific cultivation is still in its infancy.

The majority of estates are now producing, and handsome profits on their production are still obtainable. Therefore, the time seems opportune for giving a little more consideration and study to matters which may have an important bearing on the future welfare of the industry, and may ensure it being established on a sound business footing.

There are many points which require elucidation, but the writer proposes to touch upon one only—*viz.*, Seed Selection, which, in his mind, is the paramount essential, requiring our most careful study. The quality of the trees is best decided by direct experiment in the field, and having in view ways and means of procuring trees capable of giving the greatest latex yields combined with longevity, it may be of interest to record here what is taking place on the writer's estate with regard to this vital problem of seed selection, in the hope that it may encourage others to take up the all important subject on a much larger scale.

The original trees from which seeds were selected had been grown from seeds procured from some of the oldest estates in the Federated Malay States. Careful note has been kept of the respective latex yields daily, over a period of not less than a year —and still continue—from selected trees throughout the estate. Notes are regularly made as to general growth and appearance, and during the recognized seeding season, seeds from those trees which have shown the best results were gathered by an European personally, and not left to the discretion of ordinary coolies or mandors, whose work is never so thorough or reliable. This matter of gathering by a perfectly trustworthy person is all important,

because unless the data is absolutely correct, in records of experiment, the whole is useless. I may here remark that as the seed-pods burst, the seeds are scattered broadcast, and there would appear to be some difficulty, in fact, an apparent impossibility, in selecting the particular seeds of any one tree from the host of others lying intermixed on the ground. With a little care and close observation as to shape, colour and size, the task becomes simple. Further, it may be pointed out that no two trees have exactly the same seed formation. There is always some little peculiarity in the seeds of each tree, and the original pods which contained the seeds vary. Should doubt still exist pull a pod from the tree in question, open it and place a supposed seed in one of the sections. The observer will at once see whether it fits or otherwise, the outline of all seeds from the same tree being more or less alike. Again, one known seed of any one tree is always kept for comparison and from quite a large collection of mixed seeds we found no difficulty in separating those known from the unknown.

Having now detailed the first course of procedure, the next operation is to plant out the selected seeds as quickly as possible after collection, otherwise they soon lose their vitality, in a specially prepared nursery, each lot of seeds being kept entirely by itself: thus providing a safe-guard against any chance of the lots being inadvertently mixed when the seedlings are pulled for planting out.

While the seeds were germinating, an area of 15 acres of virgin jungle, slightly undulating and naturally drained, had been cleared, holed and made ready for planting out the young seedlings in the month of November. That month is selected because it comes at a time of year when the wet-season is with us, and every other day is dull or cloudy: thus ensuring a much better chance of successful life to the young plants.

Each respective lot of seedlings was carefully drawn from the nursery and planted out in the prepared holes in the formation of squares, fifty to a hundred seedlings in each square, 20′ × 20′ distance apart. Every square is numbered, and on the original plan-sheet all particulars of the parent tree are recorded; also where situate on the estate, so that when the young seedlings reach the age of maturity comparison can be made.

Up to date, we can observe a great similarity to the parent tree in so far as growth and general appearance goes, and we have every reason to feel justified in thinking that the experiment well warrants the time and trouble taken.

It is not our intention to tap those trees at an age when girth might warrant it, as is usually done in the ordinary course. They will be given every justice, with the sole idea of keeping them purely for seed-selection in the future, should the experiment bear out our anticipations.

Flaws may be found in the experiment, but nothing can be accomplished without expenditure of labour and thought, and should the only result be the gratification of one's own curiosity or hobby, it is surely a step in the right direction.

With reference to the question of seed selection the following interesting note indicates what work is being done at the Botanic Gardens, Singapore, with a view to obtaining high-yielding strains of rubber trees by careful selection of seed. (Ed.)

In a letter to the Director of Agriculture, Federated Malay States, Mr. Burkill observes:

"When a block is tapped the good trees and the bad trees are marked with crosses of red or green; and out of them further selecting will be done. The indifferent trees are not marked. But three trees have been particularly selected on account of their well-established yield, and put out of tapping that they may furnish the best possible seed. The first choice is tree No. 27 and not only has it been put out of tapping but its neighbours have been cut back that it may have more light. Seeds of it will be distributed to you and others as soon as available."

MINUTES OF ANNUAL GENERAL MEETING OF THE PLANTERS' ASSOCIATION OF MALAYA,

held at No. 12, Market Street, Kuala Lumpur, on 25th April, 1917, at 11 a.m.

PRESENT:

Mr. W. Duncan (*in the Chair*)
„ H. C. E. Zacharias (*Secretary*)

and the following MEMBERS:

From Batang Padang D.P.A.	...	Messrs. T. H. B. Phillips, J. C. Osborne and H. Gordon Graham
„ Batu Tiga D.P.A.	...	Messrs. H. L. Jarvis, T. J. Cumming, G. H. Bennett and M. A. P. Gilman
„ Central Pahang P.A.	...	Mr. P. J. A. Williams
„ Central Perak P.A.	...	„ P. G. Lawford
„ Johore P.A. ...	...	Messrs. A. L. Buyers, A. Vesterdal and F. E. Becker
„ Kajang D.P.A. ...	...	Messrs. P. R. Pinhorn, A. C. Hayton, C. R. Ferrers, G. D. B. Turnbull, E. N. T. Cummins, E. G. Leyne and G. Pennycuick-Clerk
„ Kapar D.P.A.	...	Mr. L. Mooijaart
„ Klang D.P.A. ...	...	Messrs. E. B. Prior, C. A. Buxton, R. Napier Hendric, R. Battiscombe and C. R. Harrison
„ Kuala Langat D.P.A.	...	Messrs. H. C. d'Arcy Irvine and H. L. S. Skeen
„ Kuala Lumpur D.P.A.	...	Messrs. F. G. Harvey, V. G. A. Reeve-Tucker, V. Utterson-Kelso, F. Clyde Jeavons, W. B. Anderson, A. L. S. Palmer and Lieut.-Col. A. J. Fox
„ Kuala Selangor D.P.A.	...	Messrs. Thos. H. Menzies, R. S. McCulloch, H. C. Mustard and L. A. Irving
„ Lower Perak P.A. ..	..	Messrs. Vaughan Smith, F. Adelborg and W. Sim
„ Malay Pen. Agl. Assn.	..	Messrs. M. Strivens and H. E. Mason
„ Negri Sembilan P.A.	..	„ J. Davidson McCulloch, C. Ritchie, Geo. Grant, J. Bruce and R. Gooch
„ Taiping P.A. ...	...	Messrs. A. H. Malet, E. L. Huson, F. G. Souter, H. F. Moraes and A. C. M. Tuke
„ Ulu Selangor D.P.A.	...	Messrs. W. de L. Brooke, F. G. Herose, G. C. Bailey, N. H. Dakeyne, S. Harding and O. D. Hargis

HONORARY MEMBERS—Mr. L. Lewton-Brain (Director of Agriculture), Mr. R. W. Munro.

VISITORS—Messrs. J. A Brown and G. E. Coombs.

1.—MINUTES.

The minutes of the meeting of 28th February having been taken as read,

Mr. Mooijaart points out a mistake ("particularly" instead of "practically") on page 2, line 4 from bottom, and, subject to that correction, moves that the Minutes be passed.

Mr. Munro seconds the proposal, which is carried unanimously.

2.—PREVENTIVE QUARANTINE.

The Secretary reports the formation of a Sub-Committee, consisting of Messrs. Kindersley, Mooijaart and Dr. B. Day.

He also reports the receipt of the following letter:

"Klang,
"*9th April, 1917.*

"Dear Sir,

"I give below an extract from the Minutes of the Annual General Meeting of the Klang District Planters' Association, and shall be much obliged if you will submit the same to the Standing Committee.

"Yours faithfully,
"(Sd.) C. A. Buxton,
"*Hon. Secretary, Klang D.P.A.*

"The Secretary,
"Planters' Association of Malaya."

"The advisability of closing down the Quarantine Station at Port Swettenham having been discussed at the Planters' Association of Malaya, the Meeting was unanimously of opinion that such a course would be most dangerous, and the Hon. Secretary was requested to write to the Standing Committee of the Planters' Association of Malaya, to which body the matter had been referred, stating that the Klang District Planters' Association deprecates the idea of any such course being adopted, and to mention the case of a steamer which arrived recently, amongst the coolies from which smallpox had broken out seven days after admission to the Quarantine Station, this being a typical case of what might happen at any time."

Mr. Mooijaart thinks that, as the Sub-Committee had only been just appointed, there was no point in discussing the question now and he suggests that the matter be allowed to stand over until the Sub-Committee had presented their report.

Agreed to.

3.—WAR RELIEF.

The SECRETARY refers to the Annual Report for a statement of funds collected to the end of their financial year (31st March, 1917). Since then he had received further contributions, amounting to $2,540.86.

Mr. DUNCAN hopes that the efforts made during the past year would be maintained, until such time as further relief would become unnecessary.

4.—MAN-POWER.

The SECRETARY reports the following correspondence:

"KUALA LUMPUR,
"*9th March, 1917.*

"Sir,

"I have the honour to inform you that at the last meeting of this Association held on the 28th ulto., the question of Man-Power in these States was considered.

"The Meeting was informed of the resolution passed at the joint meeting of representatives of the Federated Malay States Chamber of Mines, the Federated Malay States Chamber of Commerce and of this Association held on the 16th of January and of your reply thereto addressed to the General Secretary of the Federated Malay States Chamber of Commerce.

"This meeting expressed its great regret that the Government did not see its way to adopt the suggestions put forward by the said joint meeting, and I was instructed to convey this resolution to you.

"I have, etc.,
"(Sd.) H. C. E. ZACHARIAS,
"*Secretary.*

"UNDER SECRETARY,
"FEDERATED MALAY STATES,
"KUALA LUMPUR."

"KUALA LUMPUR,
"No. 279/17. "*12th March, 1917.*

"SIR,

"I am directed to acknowledge receipt of your letter of the 9th March, 1917, informing me of the resolution of the meeting of the Planters' Association of Malaya held on the 28th February, 1917, regarding the question of Man-Power in the Federated Malay States.

"I have, etc.,
"(Sd.) C. C. BROWN,
"*for Under Secretary to Government, F.M.S.*

"THE SECRETARY,
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

"KUALA LUMPUR,
"*9th March, 1917.*

"DEAR SIRS,

"With further reference to your letter of the 15th of January, this matter was considered at our last meeting held on the 28th ultimo, when I was instructed to inform you that the matter was not one on which this Association considers it possible to give a general reply or lay down a hard and fast rule for circumstances differing with every estate and still more so with every individual planter.

"Believe me, etc.,
"(Sd.) H. C. E. ZACHARIAS,
"*Secretary.*

"MESSRS. GUTHRIE & CO., LTD.,
"SINGAPORE."

Mr. DUNCAN wishes to explain briefly the situation, although, in the entire absence of statistics as to the numbers of men of military age and of the requirements of the country, it was difficult to decide what success had attended the effort of Government, to give voluntaryism a trial. As they all knew, the Government early last year had decided to encourage men in this country to go Home and voluntarily join the Army. A measure of success attended their effort. But the opinion seemed to be held in many quarters that the response was not sufficient and the Advisory Boards had been decided upon. It was very hard to decide whether or not the number of men sent forward from this country was as large as the number that can be spared. There were many difficulties in this respect but he had been told that the work of the Man-Power Advisory Boards had not at all been attended with success. As a result of special co-operation amongst some employers something between 150 and 200 men had been sent forward from this country. The exact number he thought, was 180, out of whom 160 had been recommended for commissions. If one officer commands 40 men in the Army then they had sent from this country men capable of officering over 6,000 men. Whether or not the results of these Boards were satisfactory it was not for him to say, but the voluntary system having now been tried, another method would have to be adopted, if the present system was deemed to have been not altogether successful.

That method obviously was the "Derby Scheme" recommended last January by the joint meeting of Chamber of Commerce, Chamber of Mines and Planters' Association of Malaya representatives. From information he had received privately he was inclined to think that the Government would now be prepared to accept such a scheme, and that any support from planters at that meeting would considerably strengthen the hand of the Government. Such a scheme, if introduced, would naturally meet with considerable

difficulty owing to the entire absence of reliable statistics relating to acreages or to Europeans on estates, and so far they had nothing to guide them in anything they wished to do. Speaking for himself, he believed that, if the Government wished to introduce some form of registration and classification, the Standing Committee of their Association should be of immense value, as they were in a position to know the conditions among planters best. He feels that if the Government would suggest to them that the Standing Committee might lay down a basis of supervision, the Committee would be able to get all the information that there was to be got and then the Government would be able to act, and, if necessary, legislate accordingly.

Mr. CUMMINS wishes to know, what proportion of Government officers who applied to join up had been allowed to go.

Mr. MOOIJAART is pleasurably surprised to hear that the Government were prepared to sanction some scheme on the lines already suggested, and suggests that they send in the same resolution again with a request that Government reconsider it.

Mr. J. D. MCCULLOCH holds that the benefit to be derived from adopting the suggested scheme now would not be so great as if it had been put in force at the time suggested. The result of the delay was that the number of Europeans in this country was probably about as much reduced as was safe, but a certain number had gone who ought not to have done so, while a few had remained who should have gone. He did not see that anything would be gained by pushing it now.

Mr. MUNRO says the point was that at present there was no registration. When they had it they would know whether or not, or how many men, could be spared.

Mr. LAWFORD asks whether the Government had given any opinion as to whether the Advisory Boards had been a success or a failure.

Mr. PHILLIPS enquires what the real object of the registration was. Was it merely that certain names would be taken down to show if there were yet men who could go and would not; or was it that compulsory service was to be introduced?

Mr. JEAVONS wishes to know whether in the opinion of the meeting more men could be spared.

Mr. HARVEY thinks that if the Government could not or would not collect the necessary information, the Planters' Association of Malaya should do so.

Mr. BENNETT would like to know the percentage of men who had been before the Advisory Boards and who had actually gone Home.

Mr. DUNCAN moves, Mr. MUNRO seconds, and it is agreed to unanimously: "That this meeting favours and would support any scheme of registration and classification of British Europeans in this country having for its object a decision as to whether or not more men can in the best interests of the Empire be spared to join the Army."

Mr. PHILLIPS suggests a rider that in informing the Government of this Resolution, the reason for it be given—*viz.*, because they were in the dark as to whether the voluntary system had been a success.

There being no seconder, the suggestion is dropped.

5.—CURRENCY.

The SECRETARY reports that he had received the following additional information *re* disposal of half-cent and quarter-cent pieces—*viz.*, that the Lower Perak District Planters' Association were prepared to take $170 per mensem and the Kajang District Planters' Association $67 per mensem of half-cent and $56 per mensem of quarter-cent coins.

He also reads the following letter:

"SINGAPORE,
"*13th March, 1917.*

"No. 5757/1915.

"SIR,

"With reference to previous correspondence ending with this office letter of even number dated the 12th February, 1917, I am directed to inform you that, as it does not appear that your Association has any urgent need for the copper coins, this Government proposes to take over part of the shipment obtained from India.

"I have, etc.,
"(Sd.) S. CODRINGTON,
"*for Colonial Secretary,*
"*Straits Settlements.*

"THE SECRETARY,
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

The SECRETARY explains that half-cent coins could now be obtained on application at the Government Treasury, in Singapore and in Kuala Lumpur, and quarter-cent coins in Singapore only. The banks had promised to assist their clients, but freight from Kuala Lumpur or Singapore would apparently have to be borne by the respective estates.

Mr. DUNCAN remarks that the Association had done everything possible and it was now up to the individual member to help putting the coins into circulation.

6.—TELEPHONE SERVICE.

Mr. MUNRO said that Mr. Irving and he had that morning waited on the Chief Secretary, who had listened to their case sympathetically and was referring the matter to the High Commissioner. Nothing more could now be done, until they heard the result of that step.

7.—MOTOR CARS.

The SECRETARY reads the following letter, receipt of which had been formally acknowledged:

"KUALA LUMPUR,
"*9th March, 1917.*

"SIR,

"I have the honour to inform you that the question of motor cars plying for hire was considered at the last meeting of this Association held on the 28th ulto., when I was instructed to forward to you the following resolution which was passed unanimously—*viz.*, 'That the Government be asked to draw up rules for motor cars on hire analogous to those regulating the traffic of rickshaws, etc., and that this should include provisions (*a*) that a driver of a motor car which is on the streets or at rest in a park plying for hire be not allowed to refuse to take an intending passenger at any time to any reasonable distance; (*b*) that all motor cars plying for hire be obliged to carry a tariff of fares.'

"I have, etc.,
"(Sd.) H. C. E. ZACHARIAS,
"*Secretary.*

"UNDER SECRETARY,
"FEDERATED MALAY STATES,
"KUALA LUMPUR."

Mr. JARVIS believes that the Kuala Lumpur Sanitary Board had taken up the matter.

8.—COURT PROCEDURE.

The SECRETARY reads the following correspondence:

"KUALA LUMPUR,
"*3rd April, 1917.*

"SIR,

"As you are no doubt aware, correspondence between yourself and Midlands Estate came up for discussion at our last meeting held on the 28th of February.

"It appears that cases have occurred when the Assistant Controller of Labour has tried, as a magistrate, labour cases in connection with which he has previously heard the complaints of the defendants.

"It is obviously most undesirable that this should take place and we understand that such cases have been exceptional ones caused through short-handedness in the Courts, but I am instructed by my Committee to express a hope that you will take every possible step to avoid such occasions which necessarily put the Assistant Controller of Labour in a most invidious position.

"I have, etc.,

"(Sd.) H. C. E. ZACHARIAS,

"*Secretary.*

"CONTROLLER OF LABOUR,

"FEDERATED MALAY STATES.

"KUALA LUMPUR."

"KUALA LUMPUR,

"*16th April, 1917.*

"No. 1912/17.

"SIR.

"I have the honour to acknowledge receipt of your letter dated the 3rd April, 1917, stating that cases have occurred at Klang when the Assistant Controller of Labour has tried, as a magistrate, labour cases in connection with which he has previously heard the complaints of the defendants and conveying an expression of the hope of Committee of the Planters' Association of Malaya that I will take every possible step to avoid such occasions which necessarily put the Assistant Controller in a most invidious position.

"2. The Assistant Controller of Labour states that no such cases have occurred while he has been at Klang. He is fully alive to the fact that if he were to try, as a magistrate, labour cases in connection with which he has previously heard the complaints of the defendants he would, to say the least, be placing himself in an invidious position.

"3. Mr. Harrison was not present in Court during the cases referred to in his undated letter which was received by me on the 3rd January last, nor can he be aware of all the interviews which take place in the Labour Office. He is no doubt under a misapprehension as to what occurred in these two places. As regards the man Irisen, Mr. Stark states that 'the man did not come to the Labour Office nor did I interview him or see him again anywhere after he left the Court on the 18th December.' So careful is Mr. Stark to avoid the appearance of an 'invidious position' that, in spite of never having seen the man in the Labour Office, he refrained from hearing the case.

"I have, etc.,

"(Sd.) J. R. O. ALDWORTH,

"*Controller of Labour, F.M.S.*

"THE SECRETARY,

"PLANTERS' ASSOCIATION OF MALAYA,

"KUALA LUMPUR."

The SECRETARY explains that the matter in question had been referred to the Standing Committee by the last meeting, and that, as a result, he had been instructed to write the letter just read by him.

Mr. HARRISON having drawn his attention to the point,

Mr. DUNCAN agrees that the Standing Committee had apparently dealt with only one of the three points referred to them (*vide* p. 33 of last minutes). He suggests that these two matters be referred back to them.

This is agreed to.

9.—RESTRICTION OF INDIAN EMIGRATION.

The SECRETARY reads the following correspondence:

"KUALA LUMPUR,
"*20th March, 1917.*

"SIR,

"I am directed to inform you that a telegram has been received from the Government of Madras dated 19th March, to the effect that the emigration of Indian labour to the Federated Malay States is to be limited to the lowest possible minimum from the 1st April next in accordance with a rule issued under the Defence of India Act, which provides that no native of India shall *depart by sea* out of India for the purpose of or with the express intention of labouring for hire in any country out of India, provided that the prohibition imposed by this rule shall not extend to any person or class of persons permitted so to depart by general or special licence granted by such authority as the Governor-General of India may appoint in this behalf.

"2. It is explained that labour in this rule means unskilled labour and does not include work of the nature referred to in Chapter XI of the Indian Emigration Act of 1908.

"3. The Chief Secretary believes that the President of the Association will desire to discuss this matter with the Controller of Labour, who has accordingly been instructed to put himself in communication with him.

"I have, etc.,
"(Sd.) S. MCARTHUR,
"*Under Secretary to Government, F.M.S.*

"THE SECRETARY,
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

"KUALA LUMPUR,
"*22nd March, 1917.*

"SIR,

"I have the honour to acknowledge receipt of your letter dated the 20th inst., *re* curtailment of Indian immigration.

"A meeting of our Standing Committee was held yesterday and was very kindly attended by the Controller of Labour. In view of the large areas now coming into tapping and the increased menace of plant diseases and pests, the meeting was unanimous in considering such curtailment as fraught with great danger to the rubber industry in this Peninsula.

"In the circumstances, the Committee agreed that 82,000 was the minimum number of assisted passages that this country requires during 1917, particularly as the number of coolies returning to India is expected to be far larger even than last year, to judge from the returns already received for the first two months of this year.

"As regards the method of carrying out the curtailment of emigration from India, the Committee considers that with the present shipping accommodation available the granting of 82,000 assisted passages will not necessitate any other special restrictions.

"I have, etc.,
"(Sd.) H. C. E. ZACHARIAS,
"*Secretary.*

"UNDER SECRETARY,
"FEDERATED MALAY STATES,
"KUALA LUMPUR."

The SECRETARY adds that a cable had since been received from the Madras Government authorizing the emigration of 7,000 coolies in April—*i.e.*, the number asked for. Ten thousand had been asked for May and 13,000 for June, but until the full reply of the Madras Government was received by letter, it was impossible to know, what would happen.

Mr. DUNCAN expresses the gratification of their Association at the support they had received from the Federal Government in this matter and enquires whether the Controller of Labour could add any fresh details.

Mr. ALDWORTH regrets having no further news. The exact number of tickets issued during April to date in India was 6,384. (Applause.)

Mr. DUNCAN lays on table report on "Indian Labour Emigrating to Ceylon and Malaya" by N. E. Marjoribanks, Esq., I.C.S., and the Hon'ble Khan Bahadur A. K. G. Ahmed Tambi Marakayar Sahib Bahadur.

In this connection it seemed opportune to refer to influences at work in India, other than Government, directed to stem the flow of emigration from India. In their annual report they suggested that there was not so much a desire to benefit the coolies as to retain labour in India and provide employers there with cheap labour. Be

that as it might, so long as they continued to provide employment in conditions as favourable as now they had nothing to fear from any honest criticism, but it was their duty to combat efforts which were not promoting the interests of the cooly.

He did not know whether members were aware of the existence of an Indian paper, devoted exclusively to the question of Indian Emigration and Colonization—*viz.*, the *Indian Emigrant*. It seemed to him advisable that members should take it in, so as not only to hear what Indian circles, such as were represented by the paper, had got to say, but also to have an opportunity of controverting untrue statements. If the editor had only the promotion of truth in view, he would obviously not be prepared to lose a large number of subscribers, as he hoped he would gain amongst employers of Indian labour in this country, by giving currency to false or distorted views of labour conditions in Malaya. The Association had taken in the paper since its inception—its cost was 10*s.* per annum—and if any members wished to subscribe to it individually, they would perhaps communicate with their Secretary.

The SECRETARY mentions that the editor, Mr. T. K. Swaminathan, was now in the country and had been given a letter of general introduction and identification by him to managers of estates so that he could see for himself the condition of the coolies. In an interview the editor said that he only wished to put in what was true, and on his attention being called to the passage in the report referred to by Mr. Duncan, said he also was of that opinion, and that he was not in favour of capitalists in India trying to keep coolies in India for their own benefit and not for the benefit of the coolies. (Applause.)

Mr. WILLIAMS says that in a Ceylon paper six months ago it was stated that Mr. Swaminathan was coming here to form a labour federation.

10.—ANTI-MALARIAL WORKS AT PORT SWETTENHAM.

The SECRETARY reads the following correspondence:

"KUALA LUMPUR,
"*22nd March, 1917.*

"SIR,

"I have the honour to inform you that I am instructed to ask you to be good enough to let me have a definite statement as to when it may be expected that the Anti-Malarial works at Port Swettenham on the lines approved in 1912 will be completed.

"I have, etc.,
"(Sd.) H. C. E. ZACHARIAS,
"*Secretary*

"THE HON'BLE
"THE RESIDENT OF SELANGOR,
"KUALA LUMPUR."

"KUALA LUMPUR,
"*19th April, 1917.*

"No. (5) in 1455/17.

"SIR,

"With reference to your letter of the 22nd March, enquiring as to the probable date of completion of Anti-Malarial works at Port Swettenham approved in 1912, I am directed to say that the Resident has no information as to any scheme having been approved in 1912.

"2. Small sums were voted in 1912 and 1913 for brick drains in Port Swettenham, and the money so voted was duly expended; while in 1914 a vote of $10,000 for drainage within the bunded area was granted, the work being completed early in 1915.

"3. Other small sums were voted during the years mentioned for swamp reclamation, extension of the bunded area, screw-down valves, etc., and in each case the work was duly carried out.

"4. It is possible that your enquiry refers to a scheme drawn up (and approved) towards the end of *1916*. If that is the case the reply to your enquiry is that it is hoped to complete the work (which was started at the very end of 1916) early in 1918.

"I have, etc.,
"(Sd.) O. F. STONOR,
"*Secretary to Resident, Selangor.*

"THE SECRETARY,
"PLANTER'S ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

11.—RUBBER THEFTS.

The SECRETARY reads the following letter:

"38, EASTCHEAP,
"LONDON, E.C.,
"*8th February, 1917.*

"DEAR SIR,

RUBBER THEFTS.

"Further to my letter of the 11th ultimo, I now enclose copy of communication dated the 1st instant forwarded by my Association to the Under Secretary of State for the Colonies to which so far no reply has been received.

"You will be kept advised of anything that transpires on this side.

"Yours faithfully,
"(Sd.) A. C. READ,
"*Acting Secretary,*
"*Rubber Growers' Association.*

"THE SECRETARY,
"PLANTERS' ASSOCIATION OF MALAYA,
"KUALA LUMPUR."

"Copy of letter addressed by the Acting Secretary, Rubber Growers' Association, to the Under Secretary of State, Colonial Office, London, S.W., under date of the 1st February, 1917."

"I am instructed by my Council to forward to you the enclosed memorandum drawn up by the Standing Committee of the Planters' Association of Malaya on the subject of rubber and latex thefts and to invite your consideration of the views expressed. A copy of the memorandum has been forwarded by the Planters' Association of Malaya to the Chief Secretary, Federated Malay States, for his information.

"2. Members of this Association are receiving constant complaints from their estate managers, and from recent reports received it would appear that thefts of rubber and latex are increasing.

"3. My Council desire to draw your attention specially to paragraph (3) of the memorandum and to express the hope that through your intervention some means may be devised for carrying out the remedies proposed, and thus overcoming the unsatisfactory conditions at present prevailing."

12.—REPORT AND ACCOUNTS FOR 1916/17.

Mr. Duncan in submitting the Report and Accounts for the past year, says the accounts were self-explanatory, but he would draw their attention to the small margin on which they had been working. The budget for next year would shortly be considered and he pleaded for a loyal acceptance of the increased rate of contributions, which were, in the opinion of their Committee, absolutely necessary.

As regards the report, it was a very full one, but there were a few facts and figures to which he would like to draw their attention. There was first of all the rate of increase in production of rubber in each year over the previous year's total.

This worked out at	88	per cent. in	1912
„	65	„	1913
„	40	„	1914
„	49	„	1915
„	41	„	1916

It was unfortunate that there were no statistics available as to the amount of land under rubber in the Peninsula, but he felt safe in saying that it could not be less than a million acres. A recent circular from the Rubber Growers' Association had shown that the present average yield worked out at 330 lbs. per acre. Taking 400 lbs. per annum as the maximum average yield, they would find that, when the present area was in full bearing, it would produce 180,000 tons per annum. But even with their production of last year, taken at an average of 2*s.* 6*d.* per lb., the value of their rubber output was already £28,000,000, whilst the capital invested in a million acres at say £60

per acre was sixty million pounds sterling. From these figures, it was obvious that their industry was a very important one and that their own responsibilities were truly huge.

What therefore concerned them as planters more nearly, was the care of the trees which they looked after. In that respect the Government, in appointing an Advisory Board to assist the Agricultural Department, had certainly taken a step in the right direction. They knew that during the war the Agricultural Department could not be so strong as it might be. Still, he believed they would agree with him that in the Agricultural Department to-day there was considerable room for improvement in organization. In the same way as rubber had been progressing it was necessary and reasonable to expect that they progressed in their technical knowledge of the product. He did not propose to enter into details before that meeting or to make criticisms of the Agricultural Department, but he might say that, in proportion to the importance of the industry in this country, the Agricultural Department might do more. He hoped that the Government would consider the matter seriously and that after the war pressure would be applied to increase its efficiency. (Applause).

Referring to labour, he would again emphasize the absence of reliable statistics, but they had put the estates population in the Federated Malay States at 196,000 in their report. For a million acres in bearing, at one cooly to three acres, their future labour requirement would be 330,000. They would also require a surplus, so their total requirement in the not far distant future would approximate to 400,000, and they had a long way to go for that.

But there was one aspect of it which could not be ignored. There were still employers of labour—a considerable number—who did not import their labour. He need not say that in that attitude those members were acting in a manner that was antagonistic to the best interests of the industry, and he hoped that these men would in future join the others and import labour themselves. (Loud applause).

One other point was the question of men granted certificates of indispensability changing their employment, but the place of a man who could leave one estate to go to another was at the front. (Applause). At the same time he held that there was a duty on the part of employers not to stick to contracts but to fix salaries with regard to the special conditions prevailing. But, on the other hand, he was quite in sympathy with the proposal which had been mooted, of making it a punishable offence for a Britisher of military age to change his employment.

In conclusion, he would like to express strongly his sense of disappointment at the absence of a Government Statistical Department for the whole Peninsula. Whether it was acreage planted, or labour employed, or rubber exported, the reply was in every instance that no reliable data were available. But unless such data were available, it

was and always would be impossible to cope efficiently and scientifically with the many problems with which they were confronted. The formation of a Statistical Department, not only for the Federated Malay States or the Colony, but for the whôle Peninsula, was a crying need and he hoped that the incoming Committee would make it their business to press for the establishment of so essential a Department.

He would now formally move the adoption of the Report and the Accounts. (Loud applause).

Mr. HARVEY seconds.

Mr. MOOIJAART gladly associates himself with the Chairman's demand for a Statistical Department. He had been astounded recently to find how few figures were available in any Government Department and he certainly hoped that a resolution in the sense indicated would be inserted in the agenda for their next meeting.

Mr. CUMMINS refers to the passage in the report *re* the necessity of employers of Chinese importing such labour and describes his own unfortunate experience in that respect.

The Report and Accounts are then put to the Meeting and carried unanimously.

13.—CHAIRMAN.

Mr. DUNCAN says that they had next to elect the Chairman for the ensuing year. There was only one nomination for the position of Chairman and that was Mr. R. C. M. Kindersley's. (Applause). He had written to say that he was, unfortunately, not well enough to attend the meeting and thanked the members very much for nominating him. He regretted keenly that he was not able to be present that day. As there was only one nomination he had now much pleasure in declaring Mr. Kindersley to be duly elected Chairman. (Applause). As they all knew, Mr. Kindersley was a very old planter and possessed particular knowledge of all matters concerning planting, and it was a further pleasure for him to be able to express their pleasure and congratulations on a further honour which had come to their newly-elected Chairman—*viz.*, a seat on the Federal Council. In both capacities he had no doubt that Mr. Kindersley would serve them well indeed. (Applause).

Mr. HARVEY proposes a very hearty vote of thanks to Mr. Duncan for his work during the past two years. (Applause). He had been one of their most successful Chairman in respect of their relations with the Government, yet he had never hesitated to speak out freely and fearlessly, whenever the occasion demanded it. He would like this vote of thanks minuted and expresses a hope that they would soon see Mr. Duncan's portrait among those fine men who looked down on them from the walls of that room. (Applause).

Mr. Harvey's proposal is carried by acclamation, and is briefly replied to by Mr. Duncan.

14.—STANDING COMMITTEE.

The Secretary informs the meeting that the Kuala Selangor District Planters' Association had sent in a resolution on the composition of the Standing Committee, but that this had only reached him a week ago.

The Chairman observes that according to Rule 13 any motion intended for the Annual Meeting had to reach the Secretary at least 21 days before the meeting and had to be inserted in the agenda. He therefore had to rule the proposal out of order.

He would now ask the meeting to vote for five members of the Standing Committee for the ensuing year and he would appoint Messrs. Mooijaart and Pinhorn scrutineers.

After the counting of the votes, the Chairman informs the meeting that the ballot had resulted in the election of the following:

F. G. Harvey	37
H. R. Quartley	33
J. D. McCulloch...	32
W. Duncan	25
L. Mooijaart	21

15.—BENEVOLENT FUND STANDING COMMITTEE.

The Chairman calls for nominations of ten members of the Standing Committee of the Planters' Benevolent Fund of Malaya. The following nominations are received:

W. Duncan	Rev. A. B. Champion
H. R. Quartley	A. K. E. Hampshire
J. D. McCulloch	J. S. Ferrier
L. A. Irving	A. Carpenter
V. A. Tayler	H. E. G. Solbe

There being no further nominations, the Chairman declares these ten gentlemen elected for the ensuing year.

16.—SECRETARY.

Mr. Duncan says that it fell once more to him to propose the re-election of Mr. Zacharias as Secretary. They all knew his excellent work and no further words of his were needed to recommend this proposal.

Mr. McCulloch seconds the proposal, which is carried unanimously.

Mr. Phillips observes that this closed the tenth year of the Planters' Association of Malaya's existence. Mr. Zacharias, who had been Secretary all that time, had mentioned to him some time ago the advisability of getting the whole of their minutes for these ten years re-printed, arranged according to subjects. He agreed that it

would be very useful to members to look up what the Planters' Association of Malaya had done already on a given matter, and he suggested that the matter be now put in hand.

Mr. RITCHIE thinks that it probably would suffice to make an abstract, instead of re-printing the whole of their old minutes, which seemed rather formidable an undertaking.

Mr. PHILLIPS proposes that the matter be referred to the Standing Committee.

LIEUTENANT-COLONEL FOX seconds the proposal, which is carried.

17.—BUDGET FOR 1917.

Mr. DUNCAN introduces the following Budget for the ensuing year, as framed by the Standing Committee:

BUDGET FOR 1917–18.

To *Agricultural Bulletin*, other printing and stationery ..	$1,000 00	By Subscriptions at 1½ cents per cultivated acre:	
„ Library	100 00	„ Kelantan P. A. ...	$ 212 69
„ Rent	600 00	„ Malay Peninsula Agricultural Association	1,225 90
„ Postal	150 00	„ Taiping P. A. ...	328 14
„ Legal Advice ...	250 00	„ Central Perak P.A.	435 50
„ Travelling and other contingencies	100 00	„ Lower Perak P. A.	526 72
„ Secretary's salary	3,000 00	„ Batang Padang D. P. A.	249 81
„ Contingent liability	2,645 00	„ Central Pahang P. A.	49 72
„ Surplus	294 25	„ Ulu Selangor D. P. A.	267 75
		„ Kuala Lumpur D. P. A.	390 39
		„ Batu Tiga D. P. A.	288 39
		„ Klang „	359 67
		„ Kapar „	336 37
		„ Kuala Selangor D. P. A.	627 97
		„ Kuala Langat D. P. A.	269 12
		„ Kajang D. P. A. ...	375 44
		„ Negri Sembilan P. A.	1,140 07
		„ Johore P. A. ...	1,055 60
	$8,139 25		$8,139 25

There was little more to say about this budget, as he had already when speaking on the accounts for the past year, emphasized the necessity for an increased contribution from all affiliated associations.

Lieutenant-Colonel Fox proposes,

Mr. McCulloch seconds, and it is carried unanimously, that the subscription for the ensuing year be assessed at $1\frac{1}{2}$ cents per cultivated acre and that the budget be adopted, as presented.

18.—GENERAL.

Mr. Huson hopes that one of the meetings of the Planters' Association of Malaya during the year would be held in Taiping.

Mr. Duncan thanks Taiping planters for the invitation, but observes that the next meeting (in June) had already been fixed to be held at Sungkai.

That concluded the business before the Meeting and he would now only draw the attention of all present to the Agricultural Conference, which opened its first session at 2.30 that afternoon and which, he hoped, would be very successful and become an annual event of increasing usefulness.

The meeting then terminates at 1 p.m.

H. C. E. Zacharias,
Secretary.

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported, with Value and Duty Collected thereon, during the Years 1917 and 1916.

Destination.	Exported during February, 1917.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.	Decrease.	Value of rubber exported, 1917, to date.	Value of rubber exported during similar period of previous year.	Duty collected, 1917, to date.	Duty collected during similar period of previous year.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	$	$	$ c.	$ c.
Straits Settlements ...	5,118.27	4,460.74	9,579.01	6,903.81	2,675.20	...	24,450,780	21,155,919		
United Kingdom ...	2,036.98	1,232.20	3,269.18	2,482.88	786.30	...	8,365,486	7,549,050		
Continent of Europe	...	...	...	...	...	...	...	Nil.	1,715,193 99	766,084 34
Ceylon	48.47	33.24	81.71	168.28	...	86.57	208,946	501,035		
Other Countries ...	46.85	268.62	315.47	123.09	192.38	...	795,772	365,449		
Total ...	7,250.57	5,994.80	13,245.37	9,678.06	3,653.88	86.57	33,820,984	29,571,453	1,715,193 99	766,084 34

KUALA LUMPUR,
13th March, 1917.

E. BURNSIDE,
Acting Commissioner, Trade and Customs, F.M.S.

Abstract of Meteorological Readings in the various Districts of Malaya for the month of January, 1917.

District.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature.				Hygrometer.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kelantan, Kota Bharu	...	140.4	79.3	84.54	71.64	12.29	73.3	.713	69.2	70.	...	7.89	1.33
Pahang, Kuala Lipis	...	...	77.31	85.48	72.06	13.42	73.94	...	...	...	...	11.21	1.62
Johore, Johore Bharu	...	...	...	83.39	71.97	11.42	...	...	...	...	...	18.07	
Singapore, Kandang Kerbau ...	29.828	162.0	79.16	84.2	72.9	11.3	75.3	.826	...	83.3	...	16.21	3.50
Malacca, Durian Daun ...	29.806	134.2	80.1	84.5	70.3	14.2	77.6	.910	...	88.	N.E.	10.35	3.26
Negri Sembilan, Seremban ...	...	142.4	77.8	87.7	70.9	16.8	76.2	.783	71.6	80.1	N.	3.11	.75
,, Kuala Pilah ...	...	134.0	80.3	87.5	70.4	17.1	77.1	.878	74.8	84.6	...	6.02	1.53
,, Port Dickson...	...	117.8	79.0	84.7	72.3	12.3	75.5	.835	73.0	82.2	...	5.98	1.06
Selangor, Kuala Lumpur ...	29.784	138.1	79.5	87.7	72.8	14.9	75.9	.826	73.3	81.	N.W.	5.23	1.41
,, Klang	...	...	78.4	83.9	72.0	11.9	74.6	...	...	...	...	4.52	1.33
,, Kuala Selangor ...	...	...	...	86.4	73.7	12.7	...	...	...	...	...	8.66	1.96
,, Rawang	...	...	...	91.6	...	...	...	...	...	...	...	13.26	2.16
Perak, Telok Anson	...	...	79.71	90.	68.	22.	76.10	.854	...	85.	...	16.62	2.55
,, Ipoh	...	...	80.13	92.	68.	24.	74.94	.800	73.76	78.	...	12.83	3.40
,, Taiping	...	112.	79.27	90.	68.	22.	75.12	.818	...	82.	...	18.70	7.48
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	13.85	3.07
,, Parit Buntar	...	...	80.75	92.	69.	23.	75.92	.833	...	80.	...	4.92	1.22
Penang Georgetown	29.829	143.4	81.5	88.7	72.	16.7	75.2	.794	...	74.	N.W.	5.62	1.80
Kedah, Alor Star	...	...	...	...	...	...	...	...	...	...	...	.03	.03
Perlis, Perlis	...	...	...	85.16	70.48	14.67	...	...	...	...	...	.47	.15